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UTAH PESTS QUARTERLY

NEWSLETTER

Utah Plant Pest
Diagnostic Laboratory

USU Extension

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NEW FACT SHEETS

EXTENSION
UtahStateUniversity

Adult western conenose bugs (*Triatoma protracta*), the species of "kissing bug" that occurs in Utah.

This August and September, the UPPDL received three samples of kissing bugs that were found feeding on people within their homes. While this is alarming, it is not new. Since 1988, the UPPDL has verified 13 cases of kissing bugs occurring in homes. In most situations, residents were being bitten. People's concern is that kissing bugs are known vectors of Chagas disease in Latin America, and while rare in the U.S., reports of vector-transmitted Chagas are on the rise in southern states. In Utah, residents should be aware that although kissing bugs occur in some parts of the State, there is no need to panic. To date, encountering kissing bugs in Utah is rare, and the likelihood of acquiring vector-transmitted Chagas in Utah is low.

For the unacquainted, kissing bugs (*Triatoma* spp.) are a true bug, and are related to other true bugs such as the boxelder bug, western conifer seed bug, and elm seed bug. Kissing bugs are members of the assassin bug family, Reduviidae, most of which are generally considered beneficial insects that capture and feed on other insects. However, some members of the assassin bug subfamily, Triatominae, are known vectors of Chagas disease in the southern U.S. and Latin America.

Eleven *Triatoma* species occur in the U.S. In Utah, only one kissing bug species occurs–the western conenose bug (*Triatoma protracta*). Its exact distribution in Utah is not known, but it was identified by the UPPDL from Duchesne, Garfield, Grand, Kane, Uintah, Wayne, and Washington counties. Recent confirmations of one western conenose bug near the Utah-Nevada border (south of Baker, NV) and two bugs from Salt Lake County indicate that it could be present in Utah south of Salt Lake County and east, extending into Duchesne and Uintah counties.

Why are kissing bugs concerning? They are known vectors of a pathogenic protozoan (*Trypanosoma cruzi*) that causes Chagas disease. The name "kissing bug" comes from their habit of feeding around the mouth and eyes. Interestingly, disease transmission does not occur directly through a bite. Rather, the pathogen is transmitted via the insect's feces. When the insect feeds it may defecate on the host. In the case of a human, scratching or rubbing infected feces into the skin or mucous membranes (i.e., around the eyes, mouth, or nose) may lead to infection. Humans can also contract Chagas through blood transfusions, organ transplants, mother-to-baby transmission, or accidental ingestion of kissing bug feces.

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The Real Story of Kissing Bugs in Utah, continued

People infected with Chagas may never show symptoms, or the disease can be life-threatening. For more information on the symptoms and stages of Chagas disease, visit the CDC's website.

Currently, there are no confirmed cases of Chagas that have originated from within Utah. With interactions with kissing bugs on the rise, the Utah Health Department is now handling Chagas as a reportable disease. To date, all tests conducted on people that have been bitten and tests on the collected bug specimens have been negative for the protozoan. The risk of acquiring Chagas in Utah is not known, but it is likely low. Further research is needed to determine the distribution of kissing bugs and the risk of acquiring vector-transmitted Chagas in Utah.

While more information becomes available on kissing bugs and Chagas in Utah, USU Extension county faculty and their diagnosticians should know what the western conenose bug looks like and what to do if they encounter a suspect specimen. Since fall is upon us, there will be an increase in calls from concerned citizens about kissing bugs.

Look-alikes of the western conenose bug found in Utah: masked hunter (top), leaf-footed bug (middle), and western conifer seed bug (bottom).

Non-triatome insects – especially western conifer seed bug and leaf-footed bug – will seek refuge inside homes this time of year. Due to their similar appearance, people may misidentify these insects as the western conenose bug. Another insect that looks very similar is the masked hunter, which is occasionally found in homes and can bite humans. Familiarize yourself with these insects and the differences between them. Any suspect kissing bug should be reported to the UPPDL to verify its identity.

Never touch a kissing bug with bare hands. Any diagnostician or person handling kissing bugs should wear latex or nitrile gloves. If someone has been bit, they should consult their doctor for testing and treatment options. In addition, collect the bug in a crush-proof container with paper towels for cushioning, or preserved in a 70% ethanol solution. Contact the State Vectorborne/Zoonotic Disease Epidemiologist, Dallin Peterson (801-538-6333; ddpeterson@utah.gov) to discuss submitting the bug to the Utah Public Health Laboratory in Taylorsville.

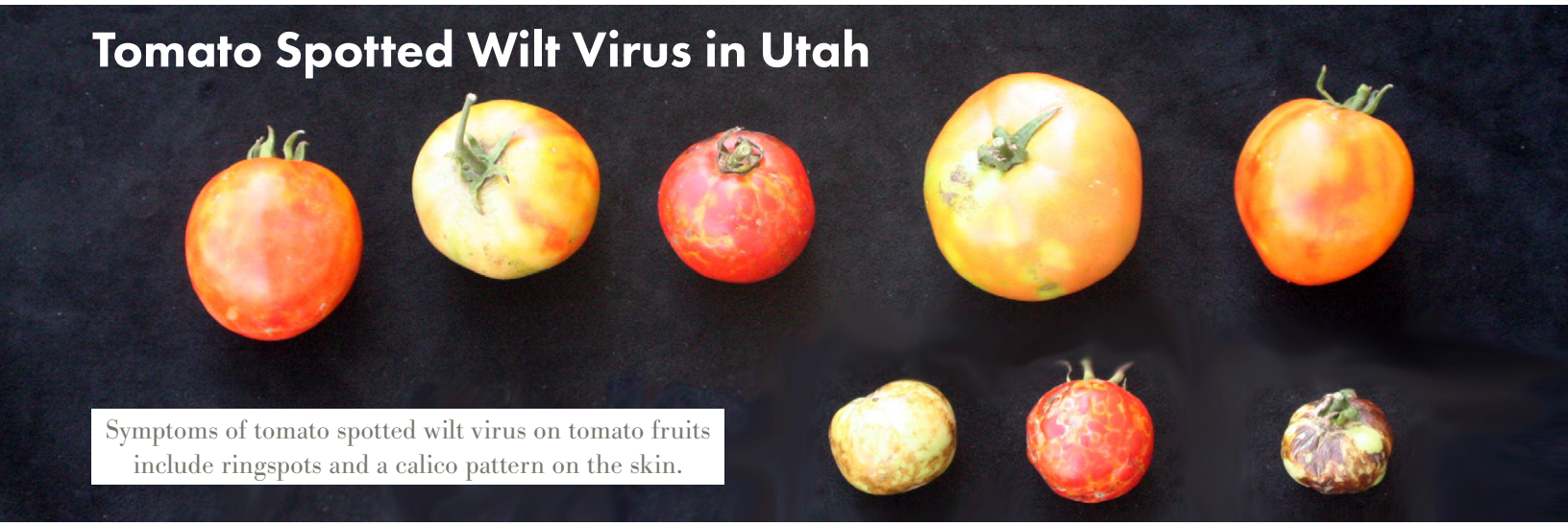
If kissing bugs are suspected and no human bites have occurred, bug samples may be submitted for testing to the Texas A&M "Kissing Bug Laboratory". Keep in mind that almost all suspect kissing bugs that are sent to the UPPDL for identification most likely turn out to be conifer seed bugs, leaf-footed plant bugs, or masked hunters.

— Ryan Davis, Arthropod Diagnostician

For more information

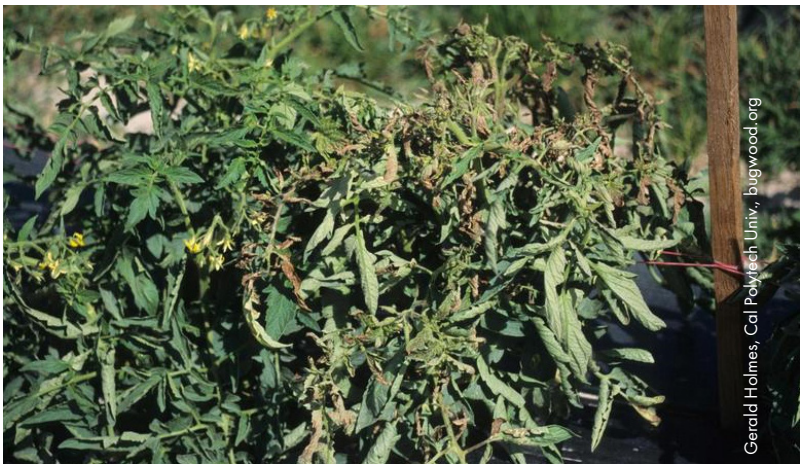
Visit the CDC website or the Texas A&M kissing bug website kissing bugs and Chagas disease.

Tomato Spotted Wilt Virus in Utah



Symptoms of tomato spotted wilt virus on tomato fruits include ringspots and a calico pattern on the skin.

Clemson University



Gerald Holmes, Cal Poly Tech Univ., bugwood.org

The virus is spread by the western flower thrips (top left). Other symptoms on tomato include small brown spots on foliage (left).

If the plant is infected early in the season, it may wilt and die from the top down (top).

In the last four years, Tomato spotted wilt virus (TSWV) has become more and more common in Utah. This virus has one of the widest host ranges of any known plant virus—over 1,000 species representing almost 80 plant families—including ornamental plants and weeds. Many plants, particularly weeds, do not show symptoms. Vegetable crops affected in Utah are tomato, pepper, and tomatillo.

The virus is transmitted by western flower thrips. This insect is tiny (less than one millimeter in size), yellow-brown in color, and feeds on plant tissue with scraping-sucking mouthparts. Adult thrips are not able to pick up the virus. Only young thrips (larvae) can acquire the virus during feeding on an infected plant, after which they are able to carry and transmit it for the rest of their lives.

During feeding, virus-carrying thrips deposit the virus into the plant through their saliva. Foliar symptoms on tomato and tomatillo consist of small brown spots. When plants are infected early in the season, peppers and tomatoes may wilt and die from the top down. Fruit symptoms on tomato and pepper consist of ringspots and a calico pattern on the skin. On peppers, the coloration is green and red and on tomatoes it is yellow, red, and orange. We have not observed fruit symptoms in tomatillos.

Due to the wide host range, there are indications that the virus is established in some Utah farmscapes. In other cases, vegetable transplants may have been exposed to the virus when growing near infected ornamentals or weeds in the greenhouse. Young transplants may not

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show symptoms, and without antibody-based testing, it is impossible to tell if vegetable plants are infected.

To reduce the possibility of infecting vegetable transplants in greenhouse production, good weed and thrips control is important inside the greenhouse. Yellow sticky cards can be used to monitor thrips presence and indicate when insecticide applications are warranted.

Management

- Thrips control with insecticides is the most common way to prevent infection. Insecticide applications can be challenging due to the development of resistance to some insecticides by thrips and their ability to hide in buds, folded leaves, and other plant parts due to their small size.
- Use resistant vegetable varieties when available. Lists of resistant tomato varieties can be found on the internet.
- Reflective mulch (silver-colored) can reduce the number of thrips flying to the plants.

Like tomato, symptoms on pepper fruit consist of ringspots and a calico pattern. The primary colors are green, red, and yellow, while on tomato, they are yellow, red, and orange.

- Remove infected plants immediately to reduce further spread.

Claudia Nischwitz, Plant Pathologist

Reduce Problems with Proper Home Vegetable Storage

It is that time of year when we can appreciate all the months of hard work on our farms and gardens. Preparing harvested produce for home storage is important; especially for long-term. Proper storage ensures the quality of the produce and reduces the risk of fungal or bacterial growth. Different produce requires different storage considerations such as temperature and humidity. It is important to remember that once harvested, the fruit or vegetable is still made up of living tissue and is continuing the physiological process of ripening. Soon afterward, however, cellular breakdown occurs. With proper handling techniques, we can help slow down this process.

Harvesting

It is best to pick vegetables (roots, leaves, stems) or fruit ("vegetables" with a seed) at the peak of maturity or slightly before. Only collect produce that is free of an evident disease or insect damage. On fruits like squashes, leave an inch or more of the stem when picking to prevent water loss and introduction of fungi or bacteria. Always handle the produce carefully to prevent cuts and bruises, as those injuries can later lead to mold or decay during storage.

Humidity and Temperature

Relative humidity is the amount of water vapor present in air (expressed as a percentage). In terms of storage, low air flow means higher humidity, and typically most vegetables are best kept at a high humidity. Open spaces within refrigerators can provide adequate conditions for vegetables requiring cold+dry conditions, while special drawers minimize air flow, allowing for storage of vegetables that require cold+moist conditions. If your home has a basement, cellar, garage, or similar cold environment; this will meet the cool+dry requirements for some vegetables. Regardless of humidity and temperature, all vegetables should be stored in the dark.

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Three Standard Produce Storage Conditions

Cool+Dry	50-60°F	60% relative humidity
Cold+Dry	32-40°F	65% relative humidity
Cold+Moist	32-40°F	95% relative humidity

It is critical to ensure there is no standing water in your storage space as this can lead to rot. Also, note that fruits and vegetables (with seed) should always be stored separately, as fruits release ethylene (C_2H_4) which will increase the ripening speed of vegetables. It is a good idea to consider using packing material when storing your vegetables. These could include newspaper, towels, or hemp cloth. Functions of packing materials include moisture retention, insulation, and preventing disease transmission.

Vegetables (with seed) are best kept in bags or containers with some ventilation to reduce the speed of wilting. Products could include reusable cloth produce bags, plastic grocery store produce bags, or Tupperware brands with openings for airflow.

Blots, Spots, and Rots...

Here are a few common things to be aware of when harvesting and storing your produce this season.

Wormy Sweet Corn

When shucking your sweet corn you might notice worms tunneling into the depths of the cobs. This is the corn earworm which is the larval stage of the moth, *Helicoverpa zea*. Though undesirable, the corn is fine to consume if damaged parts are removed and the cob is cooked properly.

Rotting Tomatoes

Some fruits such as tomato may have what is called blossom end rot at the end of the fruit where the skin and flesh turn a dark brown/black. This condition is not infectious and is caused by a calcium deficiency. These fruits are still edible if the rot is removed and there is no other damage.

Sprouting Potatoes

Be aware that sprouts on potatoes are considered toxic due to a large potential amount of glyco-alkaloids which will interfere with the human nervous system. However, if the potatoes themselves are still intact and firm, they are safe to eat as long as the sprouts are removed.

Browning Lettuce

Lettuce that is turning brown is often the result of oxidation when the cut leaves are exposed to the air. The more cuts to the leaves mean the quicker the browning. Consuming brown lettuce does not lead to any health issues or mean fewer nutrients available.

Peppers with Sunscald

Peppers are sensitive to sunscald, leading to a white deformed area on the side of the fruit. Sunscald is caused by intense direct sunlight and low humidity. These peppers are still edible if the deformation is removed and there is no other evidence of bacteria or fungal infections within the fruit. In Utah, sunscald is widespread and a common concern.

(*See next page for a table of storage conditions.*)

— Nick Volesky, Vegetable IPM Associate

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Vegetable Pests of Utah. 2018, Utah State University Extension.

Storing Garden Produce - Cooperative Extension: Food & Health - University of Maine Cooperative Extension.

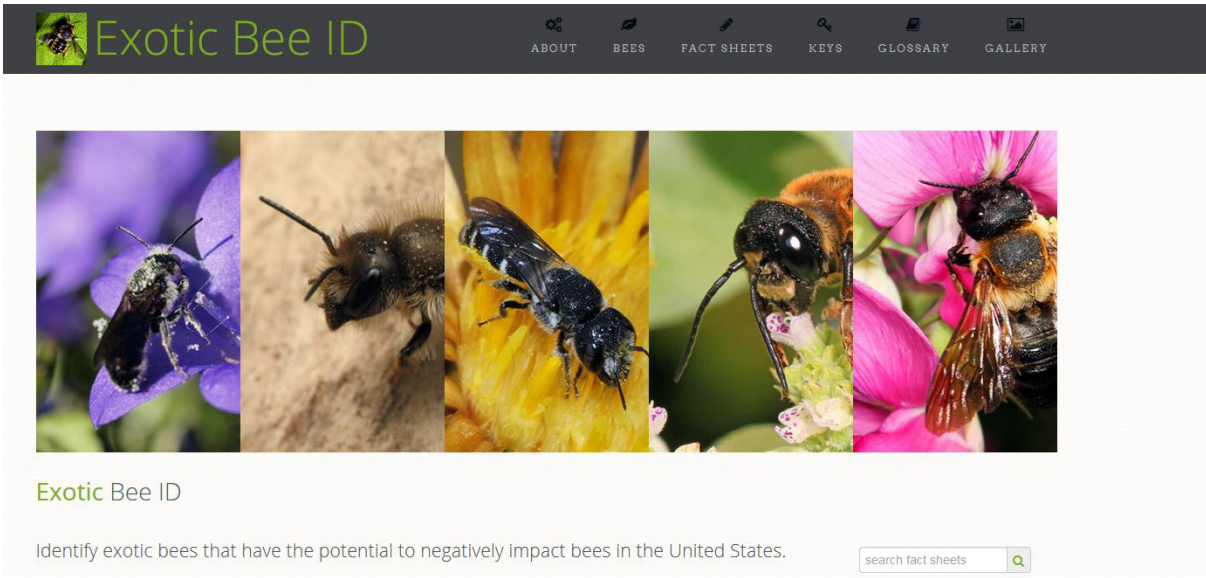
Harvest and Storage Conditions of Many Common Vegetables

(Adapted from: Tong, C. Harvesting and storing home garden vegetables. University of Minnesota Extension.)

Vegetable	Harvest When...	Storage Conditions	Shelf Life
Asparagus	Spears are 6-9 inches long	Cold+Moist	14 Days
Basil	Leaves are tender	Room Temperature	5 Days
Beans	2-3 weeks after blooms, seeds should still be immature	Cold+Moist	7 Days
Beets	When beets are about 1¼ to 3 inches in diameter	Cold+Moist	5 Months
Broccoli	Flower buds are green/tight	Cold+Moist	14 Days
Brussels Sprouts	Heads are one inch in diameter	Cold+Moist	30 Days
Cabbage	Heads are compact and firm	Cold+Moist	5 Months
Carrots	Tops are one inch in diameter	Cold+Moist	8 Months
Cauliflower	Head is white	Cold+Moist	21 Days
Sweet Corn	Silks are dry/brown	Cold+Moist	5 Days
Cucumbers	Cucumbers are around 6 inches long	Cool+Dry	7 Days
Eggplants	Before the fruit's color dulls	Cool+Dry	7 Days
Kohlrabi	2-3 inches in diameter	Cold+Moist	2 Months
Lettuce	Leaves are tender	Cold+Moist	7 Days
Cantaloupe	Fruit is firm/netting is even	Cold+Moist	7 Days
Onions	Necks are tight/scales are dry	Cold+Dry	4 Months
Parsnips	Roots reach desired size	Cold+Moist	4 Months
Peas	Pods are still tender	Cold+Moist	7 Days
Peppers	Fruit reaches desired size or color	Cool+Dry	14 Days
Potatoes	Vine dies back	Cold+Moist	6 Months
Pumpkins	Shells harden/before frost	Cool+Dry	2 Months
Radishes	Roots are 1¼ inches in diameter	Cold+Moist	30 Days
Rutabagas	Roots reach desired size	Cold+Moist	4 Months
Spinach	Leaves are tender	Cold+Moist	10 Days
Summer Squash	Fruit is 4-6 inches long	Cool+Dry	7 Days
Tomatoes	Fruit is uniformly color	Cool+Dry	5 Days
Turnips	Roots reach desired size	Cold+Moist	4 Months
Watermelons	Undersides turn yellow/fruit produces dull sound when slapped	Cool+Dry	14 Days
Winter Squash	Shells are hard/before frost	Cool+Dry	7 Months

A New Tool for Identifying Exotic Bees

Exotic Bee ID is a new web tool to help reduce risks of non-native bee introductions. The site can be accessed at idtools.org/id/bees/exotic



Bees play an essential role in ecosystem function as the dominant insect pollinators in both agricultural and natural landscapes. Unfortunately, the number of native bee species and bee populations in the U.S. are declining due to habitat loss, pesticides, parasites and pathogens, and the introduction of non-native bees and other insects.

Currently, there are 46 known non-native bee species established within the U.S. that were either intentionally or accidentally introduced. For example, a few non-native species, such as the horn-faced bee (*Osmia cornifrons*) and the European orchard bee (*Osmia cornuta*), have been intentionally introduced in the U.S. for commercial crop pollination. Many accidental introductions are due to the nesting behavior of the bee (such as in rock crevices, plant stems, or man-made structures), allowing them to be easily carried with cargo or baggage into the U.S. A well-known example is the crevice-nesting European wool carder bee (*Anthidium manicatum*) which was introduced in eastern North America in the early 1960s. This bee has a strong ability to colonize urban environments, which has allowed it to spread across the U.S. and into other countries. Whether intentional or accidental, these introductions are problematic because non-native bee species compete with native bees for flower resources and nesting sites, introduce and transmit pathogens and parasites, modify the local plant-pollinator community, and enhance the spread of non-native plants.

Proper identification is crucial to preventing new introductions. *Exotic Bee ID* is a comprehensive and sophisticated new web tool to help identify both native and non-native bees. The website is a multi-year collaborative project with USDA APHIS Identification Technology Program (ITP), Utah State University, USDA APHIS PPQ, and USDA ARS.

The European wool carder bee is an exotic bee that has successfully spread throughout the U.S.

Exotic Bee ID contains interactive identification keys, fact sheets, an image gallery, and supporting information for easy bee identification of 9 species, 3 subgenera, and 77 genera. Currently, the primary focus is bee genera within the family Megachilidae (leaf cutting bees, mason bees, carder bees), and bees in the genus *Apis* (honey bees, family Apidae). Interactive keys allow users to select characteristics that apply to their target specimens. Fact sheets can be used to find images and information on a particular bee genus or species, including their distribution, diagnostic characteristics, host associations,

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and nesting behaviors. The image gallery allows the user to compare images from differing groups of bees. Additionally, this resource can be used to learn about bee biology, behavior, and the relevant terminology used for identification.

The project team is continuing to add content and keys to identify many other native and non-native bees including additional species from *Pseudoanthidium* (Megachilidae), *Osmia* (Megachilidae), *Anthidium* (Megachilidae), *Megachile* (Megachilidae), *Xylocopa* (Apidae), and *Ceratina* (Apidae). The team is focusing on these groups because they include the majority of bees that have already been introduced into or have the high potential to invade the U.S.

Exotic Bee ID is aimed primarily at individuals working at ports of entry, state departments of agriculture, and university extension services, as well as citizen scientists with an interest in bees. Overall, the goal of this tool is to help reduce the loss of valuable native bee pollinators through early detection of non-native species.

—— Morgan Christman, USU Biology Graduate Student, Lori Spears, USU CAPS Coordinator, and Ricardo Ramirez, Extension Entomologist

The ***Exotic Bee ID*** website includes hundreds of vivid bee images, including this one, showing the scutellum (portion of the thorax) of a female *Osmia calla*.

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New Invasive Tick Detected in the U.S.

An invasive tick has been discovered for the first time in North America. In August 2017, *Haemaphysalis longicornis*, also known as the longhorned tick or bush tick, was found in New Jersey infesting an Icelandic sheep with neither a history of travel outside the country nor any recent local travel. This tick is now confirmed in eight states: New Jersey, New York, Pennsylvania, North Carolina, Virginia, West Virginia, Maryland, and Arkansas.

It is not known how or when the tick first established in the U.S. Over the years, longhorned ticks have been intercepted on livestock at U.S. ports of entry. Given that they have been detected in eight states in a relatively short amount of time, it is possible that this pest has been present in the U.S. for several years.

Longhorned ticks are native to East Asia and have become a major invasive pest of livestock in New Zealand, Australia, and some Pacific Islands, including Fiji, Samoa, and Tonga. Longhorned ticks can tolerate a wide range of temperatures from 48°F to near 104°F, with some individuals surviving as low as 14°F.

Longhorned ticks feed on various livestock, including cattle, sheep, goats, pigs, and horses, as well as humans, dogs, cats, wild mammals, birds, and reptiles. Heavy infestations can lead to weakness, anemia, and even death (especially in young animals). They are also known to transmit pathogens to humans and animals. For example, in China, longhorned ticks vector the deadly severe fever with thrombocytopenia syndrome virus (SFTSV). Specimens collected in the U.S. have been tested for Lyme disease, anaplasmosis, babesiosis, ehrlichiosis, Powassan, Heartland, and Bourbon, with all results negative so far.

Longhorned ticks go through four life stages: egg, six-legged larva, 8-legged nymph, and 8-legged adult. Adults are active in the summer, are brown to dark brown in color, and approximately 0.1 inches long but can grow to the size of a pea when fully gorged on blood. After feeding on a blood meal, each female deposits up to 2,000 eggs in the soil.

Females can reproduce through mating, or asexually via parthenogenesis (males are not required for reproduction). During late summer to early fall, the eggs hatch and the newly emerged larvae crawl onto a plant and wait for a passing host. After feeding on the host, the larvae drop to the ground where they then molt into nymphs. Nymphs are the typical overwintering life stage and become active again in the spring. They must feed on a host's blood before molting into adults. Immature life stages are very small, about the size of a poppy seed or smaller.

The longhorned tick or bush tick (left) has a wide host range, and was originally found in sheeps' ears (right). It is now known to occur in eight eastern U.S. states.

You can protect yourself and your family from tick bites and tick-borne diseases by using EPA-registered insect repellents (active ingredients: DEET, picaridin, IR3535, oil of lemon eucalyptus, para-menthane-diol, or 2-undecanone), wearing long sleeves and pants, avoiding wooded and grassy areas, and/or checking yourself and your pets after spending time in tick habitat.

Please report suspected longhorned ticks to Lori Spears (lori.spears@usu.edu). Note that the longhorned tick may be mistaken for other common ticks found in Utah. For more information about common ticks and tick-borne illnesses in Utah, consult the Utah Pests fact sheet "Ticks and Tick-borne Diseases of Utah."

— Lori Spears, USU CAPS Coordinator

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Insect Populations on the Rise in 2018

Green peach aphid • Grasshoppers • Leaf beetles • False chinch bug • Codling moth • European paper wasp

If any of these pests sound familiar to you, you are not alone. Spring and summer of 2018 in northern Utah resulted in above-average loads of flowers, fruits, and seeds of most spring-blooming trees and shrubs. But it was also a big season for many different insect pests.

The reason is most likely weather-related, as in La Niña. La Niña occurs when there are cooler-than-average temperatures in the eastern Pacific Ocean around the equator. In the western U.S., this results in a change in the jet stream, leading to fluctuating wind and precipitation patterns. Although La Niña was weak during the winter of 2017-18, it still caused slightly cooler temperatures and more precipitation in northern Utah. In addition, there were no huge spikes in highs and lows, and there was a constant layer of snow, insulating the ground and surrounding area from any temperature extremes that did occur.

In other words, the conditions in winter 2017-18 were optimal for survival of overwintering insects. To survive the winter, insects seek shelter from the cold and produce compounds in their bodies that are similar to antifreeze in cars. These compounds keep them from freezing solid. Because there were no drastic freeze- thaw events, up to 90% of overwintering insect populations potentially survived into spring. Winters with no snow cover and/or wide temperature fluctuations may allow only 20% of the overwintering population to survive.

The conditions in spring 2018 also contributed to insect survival. There were plenty of warm days with periodic rain and no late frosts. This was great for plant growth as well, where we saw heavy tree flowering and lush, succulent foliage growth.

Aphids

This spring, green peach aphid was hugely abundant. It overwinters as eggs tucked underneath buds, laid in the previous fall. Fall of 2017 was long and warm, and eased gradually into winter, allowing for plenty of egg-laying. Aphid eggs are extremely cold-hardy, surviving in temperatures up to -40°F. As such, aphid eggs are more affected by long winters (which didn't happen). In spring, they thrived on the abundance of succulent new peach and apricot growth.

Just about anyone who grew peach, nectarine, or apricot in spring of 2018 had to deal with green peach aphids (top).

Several grasshoppers species were rampant in urban gardens, from the earliest hatch in May (middle) through September.

Leaf beetles of several different species occurred in large numbers on dogwood, birch, alder, elm, and more, causing significant plant damage (bottom).

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Grasshoppers

Grasshopper populations this season were average in crops and rangelands, but in urban settings, they were very high. Grasshoppers overwinter as eggs within a protective casing, buried a few inches into the soil. This protects them from average winter conditions, but high mortality can occur if there are wide fluctuations in soil temperature or moisture. The constant snow cover in many areas of Utah prevented these extremes from happening.

Grasshopper populations are further affected by conditions during egg hatch. Newly-hatched nymphs are most vulnerable to adverse weather conditions, easily killed by extended cool temperatures (less than 65°F) and rainy weather. Instead, they thrived this spring in northern Utah's warm weather with periodic rainfalls.

Leaf Beetles

In some areas of Utah, especially those near wild habitats, leaf beetles were common (see "Skeletonizers in the Closet" in the spring 2018 edition of Utah Pests News). Most species overwinter as adults in protected areas. Again, the milder fall and winter temperatures, winter snow cover, and lush spring growth all contributed to higher populations of these pests.

Codling Moth

Codling moth is the primary pest of apple and pear. It overwinters as a mature larva in bark crevices or in leaf litter, able to withstand temperatures well below 0°F. Their survival is more dependent on spring emergence conditions, abundance of available food sources, and accumulation of warmth over the growing season. The summer of 2017 resulted in the second-highest accumulation of summertime degree days in the last decade (after 2012), allowing for a large overwintering population. Spring of 2018 came on gradually and warmly, with a synchronous emergence of codling moths across much of northern Utah, and plenty of fruit to feed in.

False Chinch Bug

False chinch bugs suck sap from plants during feeding. But they are often considered more of a nuisance pest. When field conditions are hot and dry, adults will aggregate into "swarms" and invade irrigated landscapes, seeking shelter and higher humidity. In Utah, June to July of 2018 was the second-hottest period on record (behind 2007), and the entire summer of 2018 broke multiple state records for the highest nighttime temperatures.

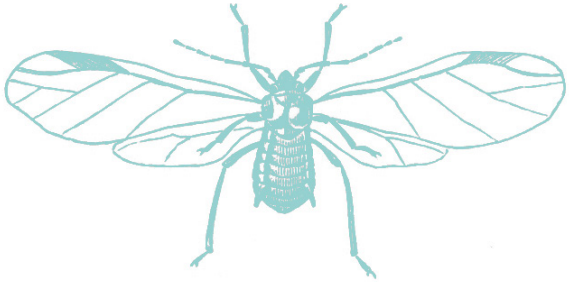
Codling moth was so prevalent in 2018 that some growers had a hard time keeping them from attacking their fruit (top).

Although false chinch bug can feed on plants, it is more of an indoor nuisance pest (bottom).

In conclusion, the following factors may result in high populations of certain insect pests -

- High summer and fall temperature the year prior.
- Minimal extreme temperature fluctuations in late fall, winter, and spring, and constant winter snow cover.
- Warm spring conditions with periodic rainfall.

Marion Murray, IPM Project Leader



IPM In The News

Biocontrol for Fall Armyworm in Africa

Fall armyworm was introduced into Africa in 2016, and has since caused severe damage to cereal crops, with estimated losses of $2 to 6 billion per year in maize alone. One of the problems is the moth's ability to burrow within plant material, protecting it from insecticide applications. Virginia Tech and East African entomologists have identified two egg parasitoids native to Africa in the *Trichogramma* and *Telenomus* genera that offer a promising tool to managing fall armyworm. In 2018, the team will mass-rear and release these wasps into Kenya, Tanzania, and Ethiopia. The wasps target fall armyworm egg masses, killing the pest before it reaches the larval stage.

Breeding Resistance to Aphids in Soybeans

Each year, soybean aphids cause billions of dollars in crop losses, especially in the Midwest. The soybean aphid is a genetically diverse species, and can quickly overcome plant resistance, so new sources of soybean aphid resistance need to be identified. In a recent study, entomologists and others at the University of Minnesota have taken a big step toward identifying new soybean genes associated with aphid resistance. To do so, the researchers scanned the soybean genome for small genetic landmarks, called SNPs (pronounced "snips"). Then they tested if any of these landmarks were present more often in soybean varieties that are resistant to aphids. They were able to find several soybean varieties with genetic landmarks associated with aphid resistance. Their ultimate goal is to breed multiple resistance genes into single soybean varieties to generate a robust resistance.

Sting Bug Pheromone Discovery

Researchers from Virginia Tech are studying the chemical communication of stink bugs and how they synthesize their pheromones. Years of research have shown that several species of stink bugs, including the brown marmorated stink bug and the harlequin bug, use enzymes to synthesize pheromones without receiving them from symbiotic microbes or the host plant, as was previously thought. The researchers conclude that this new knowledge may allow for a variety of tools such as improved lures, mating disruption, or embedding pheromones in non-food "trap crops."

Newly-Discovered Enzyme Fires Plant Immunity

Plants have a large repertoire immune responses to plant pathogens. The laboratory plant *Arabidopsis*, for example, has about 600 cell receptors that could respond to different pathogens. Plant pathologists at UC Davis have now identified a key step in how plant cells respond to pathogens. They isolated an enzyme, SIK1, in *Arabidopsis* that is the "firing pin" of plant immunity. When the researchers deleted SIK1, the plants were more susceptible to infections. They are now looking to see if the gene can be tuned up to boost resistance to pathogens in crops. That could lead to new treatments for plant diseases and breeding of crops that are more resistant to infections.

Understanding a Deadly Grape Virus

Grapevine leafroll disease is caused by a virus ("leafroll 3") and costs growers millions of dollars nationwide in lost vines and productivity. Once in a vineyard, infected plants must be removed and destroyed. The leafroll 3 virus has one of the largest genomes of plant viruses, and is difficult to work with, such as testing vines for resistance. After a year of work, researchers in WSU's Department of Plant Pathology discovered how to clone leafroll 3. With this new knowledge, they are now perfecting an inoculation technique. They hope to soon create defenses against the disease, such as an inoculant, or a designer virus that delivers genes to help plants resist the disease.

New Publications, Videos, Books, and Apps

- The Organic Center has released a new report, titled Organic Agriculture: Reducing occupational pesticide exposure in farmers and farmworkers that synthesizes more than 120 research studies.
- A comprehensive review paper covering Squash Vine Borer was recently published in Journal of IPM.
- eOrganic has posted articles from students at the University of Maine and at Cornell University on the use of tarping to control weeds in organic vegetables.
- Cornell recently published Reduced Tillage in Organic Systems online.

Featured Picture of the Quarter

These two images show *Watermelon mosaic virus* (WMV) symptoms on squash leaves found in summer 2018. WMV is spread by aphids.

The interesting feature of these images, however, is not the virus symptoms, but rather the interaction of the virus with an insect-caused symptom.

The plant had been heavily infested with silverleaf whitefly, which typically causes leaves to take on a uniform, silvery sheen. On plants with the virus, however, only the dark green mosaic patches showed the silver discoloration. The leaves of the neighboring plants that didn't have WMV were completely silver.

Silverleaf whitefly does not overwinter in northern Utah, so it must be reintroduced each season on wind currents or plants. Plant damage is sporadic on cucurbits, particularly squash and watermelon. The silvering of the foliage is a response of the plant to the feeding and saliva of the whiteflies.

Photos by Claudia Nischwitz, Plant Pathologist

New Addition to UTAH PESTS Team

Welcome the newest member of the Utah IPM Program and the UTAH PESTS team. We are pleased to welcome Nick Volesky as our Vegetable IPM Associate.

Nick hails from Nebraska and is a Horticulture graduate from the University of Nebraska. He has interests in food production, sustainability, and using IPM as a problem-solving tool for Utah's agricultural systems.

He is excited to represent the Utah IPM Program, and to share innovative and effective pest management strategies with Utah citizens.

Clipart courtesy of FCIT

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