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Utah Plant Pest
Diagnostic Laboratory

USU Extension

N E W S L E T T E R

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Leafy Gall of Dahlia

Left: Proliferous shoots at the base of a dahlia plant caused by *Rhodococcus fascians*.
Right: Crown gall, which symptoms of leafy gall of dahlia can resemble.

In 2023, dahlia samples were sent to the Utah Plant Pest Diagnostic Lab that had tumors at the base of the main stem with numerous shoots developing in dense clusters. The disease is caused by the bacterium *Rhodococcus fascians*. *R. fascians* has a wide host range of herbaceous plants but, so far, we have only seen it on dahlias in Utah.

The symptoms are sometimes mistaken for crown gall. The difference between the two diseases is that with crown gall, no shoots develop on the tumors. The bacteria are commonly introduced onto a farm on infected, vegetatively propagated plant material, such as when cuttings are taken from infected plants.

The pathogen can survive on a plant for months without causing symptoms, making it very difficult to detect early. When it enters plant cells, it produces hormones like auxins and cytokinins that trigger the formation of galls and shoots. Once it has been introduced onto a farm the bacteria can spread in splashing water and flood

irrigation. It is not known to be transmitted by insects. There have been reports that it can be spread by pruning tools when trimming plants or harvesting flowers.

Management options are preventive. There is no cure for infected plants.

1. Sanitation is very important. Remove infected plants and place them in the trash. Do not compost them. If pots are re-used, they need to be disinfected with a 10-15% household bleach solution for at least 30 minutes. Sterilize pruning tools and snips regularly during harvest or pruning with a 70% ethanol solution, bleach or disinfecting wipes.
2. Only tubers from non-symptomatic plants should be divided for propagation and cuttings should only be taken from healthy, non-symptomatic plants.
3. Remove plant debris including fallen leaves.



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Meet Pepper, the Rescue Scorpion

Dr. Victoria Xiong is an Extension Assistant Professor in horticulture and small farm agriculture for Kane County. She runs the Master Gardener program, renovated the local Farm to Table program, and researches agronomic issues. She also has a passion for insects!

Many things can be used as office decorations: books, furniture, art, Legos, and plants. Even though “to show off” or “sounds so cool” are not rational reasons or correct attitudes to own a pet insect or arachnid, the USU Extension office in Kane County recently welcomed a unique office pet to the team. Meet Pepper, the rescued scorpion.

Pepper was found by one of the Master Gardener’s grandchildren in their family shop east of Kanab, Utah, in mid-October. Begging the Master Gardener not to kill the venomous arachnid, the child suggested the gardener trap the scorpion in a peanut butter jar and relocate it to the Extension office since she considered the agricultural agent Dr. Victoria Xiong, a “cool bug lady”. Now Pepper is the happy resident of a sealed terrarium complete with ventilation and a side heating pad in the Extension office.



Pepper has been identified as an Arizona bark scorpion (*Centruroides sculpturatus*), which is the most venomous scorpion in North America. The adult Arizona bark scorpion averages about 3-3.5 inches, but Pepper is only three-quarters of an inch long. She is still very young, so we expect to have at least five years of office-mate time together.



In an attempt to mimic her natural desert habitat, the terrarium is filled with approximately 2 inches of natural pink and orange coarse sand and one inch of small untreated red rocks, topped with cottonwood limbs, juniper mistletoe crumbles, a water bowl, and an artificial hallow tree bark. Even though desert scorpions require little water to drink and rarely need to be misted, Pepper often plays in her water bowl. She dips her tail into the water and then makes small sand balls to roll around.

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True to her natural behavior, Pepper is an introvert and nocturnal. She doesn't quite like the extension office's regular nine-to-five work schedule. She will raise her claws and wave them at whomever tries to greet her. Then, she will hide under the tree bark or in the burrow she made the night before. Because she ate a big meal before becoming the office pet, she does not need to be fed until January. Her choice of food is one calcium-coated cricket from the pet store. The feeding time will be after dark, and the Extension office will try to record the feeding under UV LED lighting, since scorpions glow under UV lights.

More Information:

- Caring for scorpions:
<https://www.amentsoc.org/insects/caresheets/scorpions.html>
- Soothing a scorpion sting:
<https://web.archive.org/web/20090603092350/http://www.opa.medicine.arizona.edu/horizons/2000/fall/pg21.htm>

Pest Problems in Delphinium and Larkspur Cut Flower Production



Delphinium (top) and larkspur (bottom) production.

In Utah, the popularity of cut flowers is steadily increasing, drawing economic, cultural, and agricultural interest. As of 2023, there are 199 known farms cultivating flowers within the state. Two species, delphinium and larkspur, have gained prominence amongst florists and growers, with 72% of cut flower farmers growing them in 2022. Delphiniums are short-lived perennials, recognized for their tall spikes adorned with densely packed, vibrant, and delicate blossoms in various colors, including unique shades of blue. Larkspur, a closely related annual species, boasts gracefully spurred blossoms in a spectrum of soft colors. As cut flowers, both species are captivating, lending an elegant and dramatic line that provides height and balance to floral arrangements. Nationally, both flowers hold economic significance for the cut flower and potted plant industry. In 2023, the Boston Terminal Market priced one bunch of ten delphinium stems at \$17.50-\$20.00, and ten bunched larkspur stems at \$12.50-\$15.00, as provided by the USDA AMS Specialty Crops programs.

Insects and plant diseases present significant threats to the quality and marketability of cut flowers, capable of causing physical damage, reducing aesthetic appeal, and compromising the overall health of floral crops. Both delphinium and larkspur are no exception to pest pressure. Interestingly, both flowers contain high levels of diverse diterpenoid alkaloids, rendering them poisonous to humans and other mammals. Therefore, these flowers are often marketed as deer and rabbit "resistant" for home gardens. Despite their toxicity, various insect species have evolved to feed on delphinium, larkspur, and other poisonous plants, thanks to specialized digestive tracts working in conjunction with enzymes and other microorganisms.

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CUT FLOWER PRODUCTION, CONTINUED



During summer 2023, Nick Volesky from the USU Extension Integrated Pest Management program/USU Small Farms Lab surveyed delphinium and larkspur grown in research plots at the Utah Agricultural Experiment Station in North Logan for pest activity. Identification was carried out by Volesky and Extension Plant Pathologist, Claudia Nischwitz.

To learn more about pest management in specialty crops, reference fact sheets, videos, and other guides at extension.usu.edu/pests. Additionally, smallfarmslab.com provides resources relating to flower cultivars, optimal planting dates, season extension practices, and sustainable nutrient, soil, and water management. If you need identification of an arthropod or plant disease issue, reach out to the Utah Plant Pest Diagnostic Lab.

Upper left: Fungal disease of larkspur
 Lower left: Slug feeding on delphinium
 Lower right: Lygus bug feeding on larkspur



Compilation of insect pests, plant diseases, and other pests observed on delphinium and larkspur at a North Logan research farm in 2023. Pests are ordered by damage severity.

Species	Description	Management
Milky slug (<i>Deroceras reticulatum</i>)	Small (20-60mm), land slug with a distinctive translucent and mottled appearance. Common in wet and humid areas, such as high tunnels. Damage includes extensive foliar feeding.	Reduce excess moisture and standing water in production space. Set up copper-based barriers around plants. Place traps and bait products containing iron phosphate or metaldehyde.
Powdery mildew (<i>Erysiphe aquilegiae</i>)	White, powdery coating (spores) on the leaves and stems causing reduced photosynthesis, distorted growth, and overall aesthetic degradation of the plants.	Use appropriate plant spacing. Monitor for infection early in the season. Use fungicides containing myclobutanil and sulfur (do not apply sulfur above 90°F). Fungicides may not be effective later in season. Remove and destroy plant stems after frost.
Army cutworm (<i>Euxoa auxiliaris</i>)	Caterpillar is the general term for the larval stage of moths and butterflies. Size, color, pattern, and life cycle is dependent on the species and instar. Damage severity is correlated to population numbers and host presence. Feeding damage primarily occurs in the foliage, but may extend to other plants parts.	Reduce weed pressure (alternate hosts) in production areas. Handpick and remove larva when spotted. Till or disk soil when not in production to disrupt overwintering life stages. Purchase or encourage natural enemies (predators and parasites) of caterpillar species. Spray for early instars with insecticides containing zeta-cypermethrin, spinosad, <i>Bacillus thuringiensis</i> , permethrin, cyfluthrin, etc.
Alfalfa Looper (<i>Autographa californica</i>)		
Cabbage Looper (<i>Trichoplusia ni</i>)		
White-line sphinx moth (<i>Hyles lineata</i>)		
Unspecified larva (Subfamily Heliiothinae)		
California tortoiseshell (<i>Nymphalis californica</i>)		
Damping-off (<i>Pythium</i> spp., <i>Phytophthora</i> spp., <i>Rhizoctonia</i> spp., <i>Rhizopus</i> spp., or <i>Fusarium</i> spp.)	Damping-off is a generalized term describing dieback in transplant greenhouse production caused by various soil-borne fungi. It is characterized by the sudden collapse and decay of seedlings or young plants at or near the soil surface, resulting in rotting stems and impaired plant growth.	Preventative measures include sanitation (using a 10-15% household bleach solution) of growing benches and containers along with sourcing sterile potting mix. Avoid excessive irrigation and standing water. Apply fungicide drenches containing <i>Trichoderma</i> spp.

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CUT FLOWER PRODUCTION, CONTINUED

Species	Description	Management
Differential grasshopper (<i>Melanoplus differentialis</i>)	Grasshoppers are highly mobile and characterized by their large hind legs. Size, color, pattern, and life cycle is dependent on the species and instar. Damage severity is correlated to population numbers and host presence. Feeding damage primarily occurs in the foliage, but may extend to other plants parts.	Manage over a large area due to their high mobility. Bait (wheat bran with carbaryl or Nosema locustae) used by late May/early June is effective, as are insecticides with acephate, beta-cyfluthrin, or bifenthrin. Physical exclusion using insect netting often works best.
Two striped grasshopper (<i>M. bivittatus</i>)		
Red legged grasshopper (<i>M. femurrubrum</i>)		
Migratory grasshopper (<i>M. sanguinipes</i>)		
Western flower thrips (<i>Frankliniella occidentalis</i>)	Very small (1.5mm) slender insects with fringed wings. Plant feeding damage is caused by puncturing and scraping of plant tissue, resulting in silvery scars and distorted growth.	Populations tend to peak in mid-summer, but monitor throughout the season. Scout in the morning when they are often in leaf crevices or blooms. Hand removal or pellets with spinosad are most effective. Other options: containers with bait (soy sauce, oil, etc.) and a perforated lid that are buried up to the lid and emptied periodically.
European earwigs (<i>Forficula auricularia</i>)	Elongated, brown bodies with a prominent pair of rear cerci. Hide in tight and dark spaces on the plant. Damage severity is correlated to population numbers and host presence. Feeding damage primarily occurs in the foliage, but may extend to other plants parts.	Populations tend to peak in mid-summer, but monitor throughout the season. Scout in the morning when they are often in leaf crevices or blooms. Hand removal or pellets with spinosad are most effective. Other options: containers with bait (soy sauce, oil, etc.) and a perforated lid that are buried up to the lid and emptied periodically.
Fungus gnat (Superfamily Sciaroidea)	Very small (3mm) and mosquito-like with long legs and slender bodies. Worm-like larvae consume organic matter in the soil and occasionally damage plant roots and leaves touching the soil surface. Transplant production in the greenhouses are most susceptible.	Trap and monitor fungus gnats and white flies by using yellow sticky traps. Ensure proper drainage in soil media trays. Consider purchasing natural predators such as predatory mites, wasps, beetles, etc. Consider insecticides labeled for greenhouse control containing horticultural oils, pyrethrin, azadirachtin, bifenthrin, etc.
Greenhouse whitefly (<i>Trioletodes vaporariorum</i>)	Very small (1.5mm) and moth-like with white waxy wings and a light-yellow body. Damage is caused by adults and nymphs with their piercing-sucking mouthparts. This causes yellowing, wilting, and the secretion of sticky honeydew on plant surfaces. Transplant production in greenhouses are most susceptible.	
Tarnished plant bug (<i>Lygus lineolaris</i>)	Small true bugs (~6mm), mottled brown with a distinctive triangular shape on their back. Adults and nymphs frequently damage plants by piercing them with their needle-like mouthparts, causing stippling, distortion, and discoloration of plant tissues.	Populations tend to be greatest mid-summer to fall, but monitor throughout the season. Reduce weed pressure (alternate hosts) in production areas. If populations reach damage threshold, consider insecticides containing permethrin, gama-cyhalothrin, or malathion.
Western tarnished plant bug (<i>Lygus hesperus</i>)		
Unspecified leafhopper (<i>Eratoneura</i> spp.)	Very small (3mm), light colored leafhopper with intricate patterns on their wings. Infrequent damage caused by adults and nymphs with their piercing-sucking mouthparts causing stippling and yellowing.	Monitor all season, especially during bloom. Reduce weed pressure (alternate hosts) in production areas. If populations reach damage threshold, consider insecticides containing acephate, acetamiprid, bifenthrin, cyfluthrin, deltamethrin, lambda-cyhalothrin, or permethrin.
Springtail (Collembola)	Very small (>5mm) hexapods with a spring-like furcula. Feed on decaying soil organic matter and occasionally create small holes on young seedling cotyledons.	Monitor for seedling damage during cool wet periods. Management is rarely needed.

— Nick Volesky, Vegetable IPM Associate
Melanie Stock, Urban & Small Farms Extension Specialist
Claudia Nischwitz, Plant Pathologist

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Friend or Foe: The Multicolored Asian Lady Beetle

Lady beetles, which are sometimes called ladybugs or lady bird beetles are a common and well-loved beneficial insect found in many gardens. All lady beetles belong to the Coccinellidae family which is in the order of beetles (Coleoptera). There are over 400 native species of lady beetle in the United States.

The multicolored Asian lady beetle (*Harmonia axyridis*), however, is not native to the United States despite being found across the country. This beetle is originally from Asia as its name would suggest, but it was released in California as a biological control agent in 1916. Additional releases occurred in the 70s and 80s in other states and in 1988 the first extensive populations were found in New Orleans. This was the first sign that this might be a problematic insect. The multicolored Asian lady beetle is now well established in North and South America, though it is unclear if this is because of purposeful introductions, accidental introductions, or a combination of the two. Regardless of how it arrived, this beetle has managed to become quite successful at establishing itself in new places and is now considered an invasive species on a global scale.

Because this insect is both considered a beneficial lady beetle and also an invasive pest, it can be hard to know if it is a “good guy” or a “bad guy”. Well, the reality might not be quite so black and white. These beetle falls more in the gray scale, despite its bright red-orange coloration.

Friend

Contrary to misinformed graphics making the rounds on social media, the Asian lady beetle, as it is often called, is not aggressive, pet-harming, and useless in the garden. While it does have the ability to bite, as do all lady beetles, it only causes minor, short-lived discomfort and it does not do so often.

This voracious predator can eat more than 100 aphids per day as an adult and the teenage larvae are often even hungrier. It is thought to be a more effective biological control agent than native lady beetle species, which is why it was released repeatedly in pest control programs. The multicolored Asian lady beetle impacts pests that injure a wide array of commodities such as fruit orchards, Christmas trees, ornamental plants, small grains, and many agricultural crops. In many cases, the need for insecticides has been reduced because this lady beetle is around.



The multicolored Asian lady beetle has many color variations. The most common in Utah has a red to orange background color and 18-19 spots.

All color variations have a black M-shaped marking behind the head, which may be broken or full. Photo credit: Wikipedia

Foe

This invasive species does have some negative aspects, though not enough to warrant its extremely negative reputation in recent years. These beetles form large aggregations in and on buildings, and in extreme cases, can be found by the thousands. While indoors, these beetles can cause staining with their fecal spots, and release a foul odor as a defense mechanism.

They have also been known to cause fruit damage when they run out of prey. Grapes, apples, and raspberries have all been affected, but only once the

tough outer skin of the fruit has been damaged by another pest or pathogen. These beetles also have very bitter-tasting blood and even a single one crushed in a cluster of grapes can ruin large quantities of wine, resulting in a distinctly unpleasant flavor known as “lady beetle taint”. Last, but not least, this insect like many invasives, threatens local diversity. This foreign species might be out-competing native lady beetles for prey or may even be feeding on their eggs.

— Kate Richardson, Invasives Species Specialist

Grasshopper Nematodes

When people hear about nematodes, our first thought might be “plant parasites.” Plant parasitic nematodes are microscopic and can cause major yield losses. However, nematodes are not just microscopic soil-dwellers. In a recent grasshopper survey conducted at Utah State University, students found a type of nematode called a mermithid. Mermithid nematodes tend to be insect parasites and are related to plant parasitic dagger nematodes. The species found in the survey was identified as *Mermis nigrescens*. *M. nigrescens* almost exclusively parasitizes grasshoppers but there are some reports of parasitism in earwigs as well. These mermithids begin at a length of 0.5 mm and can grow to be over 160 mm long.

Adult mermithids perform sexual reproduction in the spring or summer and females emerge from the soil during water events to lay their eggs on leaves. Grasshoppers ingest the eggs while feeding on the leaves. The eggs hatch inside the grasshopper and the juveniles burrow into the body cavity of the grasshopper. After 1 to 3 months, the juvenile finishes growing, bursts from the dead grasshopper, and returns to the soil. They may spend around 3 years in the soil, but a 2-year life cycle is common.

Because of the host specificity and lethality, there has been some research done to examine the potential use of *M. nigrescens* as a biocontrol agent for grasshoppers. However, the length of the life cycle and habitat moisture requirements make it difficult to infect certain species of grasshoppers. Grasshoppers in the genus *Melanoplus* are the most common grasshoppers in Utah and only seem to suffer from parasitism when living in moist habitats. A survey in Colorado observed mermithid parasitism in 0.5% of the samples taken.

There are a few different areas that need to be studied to determine the use of *M. nigrescens* as a biocontrol:

- The relationship between the preferred foliage of the grasshopper and the preferred foliage for mermithid eggs
- The number of eggs a grasshopper needs to ingest in order to have a lethal infection
- The type of soil preferred by *M. nigrescens*
- The light and heat preferences for egg laying of *M. nigrescens*

For more information:

- Capinera, J.L.. (1987). Observations on Natural and Experimental Parasitism of Insects by *Mermis nigrescens* Dujardin (Nematoda: Mermithidae). *Journal of the Kansas Entomological Society* 60, 159–162.
- Mongkolkei, Smith, and R. M. Hosford Jr. (1971). Biological control of the grasshopper *Hesperotettix viridis pratensis* by the nematode *Mermis nigrescens*. *Journal of Nematology* 3.4:356.



Tim Miller, Utah State University



John Capinera, University of Florida

M. nigrescens emerging from a grasshopper (**top**).

Eggs of *M. nigrescens* on grass foliage (**bottom**).

— Tim Miller, Research Technician UPPDL

Scaling Trees for Insects

Winter is a great time to inspect trees and shrubs for pest problems that affect the bark. With the leaves gone, one type of insect in particular – scales – shows up well. Scales are immobile insects with a roundish body that sucks plant sap or cell contents. The species below are common in Utah on deciduous trees. Identifying scale problems now and making a management plan can prevent larger problems in the future.

To help discover the presence of scale bodies on branches and twigs, look for darkened areas of the bark that would indicate old sooty mold that grew on scale honeydew last summer. If this is detected, the type of scale that may be present belongs to a family known as soft scales (Coccidae). Plan to get your magnifying lens and conduct some up-close inspection. Look for round, oval, or oblong “bumps” (that can be flaked off with your fingernail). Colors include light tan, rust, dark brown, light gray, and dark gray.

Another common family of scales are armored scales (Diaspididae). These scales are not associated with sooty mold, as they do not produce honeydew. Look for dead or dying twigs or branches, and hardened white or gray colored scale bodies on the bark.

All scale families can be suppressed with thorough coverage of horticultural oil in spring as leaf buds start to swell.



European Elm Scale (Soft Scale)

Young European elm scales are light brown, oval, and flattened. As they mature, they darken in color and are outlined with a white, waxy material. Eggs hatch in early summer.



San Jose Scale (Armored Scale)

San Jose scale is most common on apple and pear. While it can cause limb dieback, the scales feed on the fruit as well, reducing yield. San Jose scales are round, hard, gray to black, and cone-shaped, with a tiny white knob in the center. Look for areas of roughened bark and then use a hand lens to seek out the scales. On smaller twigs with very smooth bark, you may see a purple halo around the scale bodies.

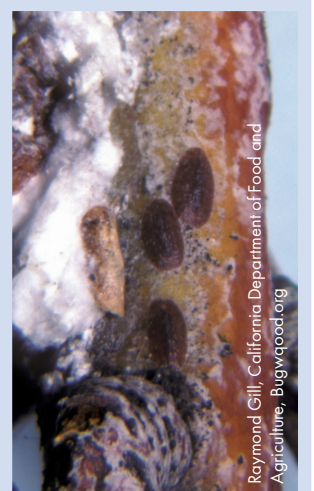
Lecanium Scale (Soft Scale)

In early winter, lecanium scales are small, flattened, immature scales occurring on dozens of deciduous tree species. In late winter, females start feeding and swell. They continue to swell in spring with large masses of eggs. In late spring, inspect females by turning their bodies over. Tiny beads under the body indicate eggs and white fluff under the body indicates hatching was successful.



Cottony Maple Scale (Soft Scale)

In winter, cottony maple scales are flattened, oval, and brown on maples and many other deciduous host trees. This scale is most visible in spring when females produce their cottony, waxy egg sac that contains up to 1,500 eggs. In the image above, the smaller scales to the left of the female resemble what you would see in winter.



Raymond Gill, California Department of Food and Agriculture, Bugwood.org

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**Sycamore Scale
(Steingelliidae)**

Look for sycamore scale on sycamore and London plane tree in crevices on the bark of the main trunk. In mid to late winter, cottony masses are visible under bark flakes. These eggs hatch when leaf buds start to open.

**Oystershell Scale
(Armored Scale)**

If left untreated, oystershell scale can increase to large numbers and cause dieback on a wide range of host trees and shrubs. These brownish-gray scales are visible with the naked eye and shaped like an oyster or mussel shell.



Marion Murray, IPM Specialist

Old and New Invasive Fruit Flies

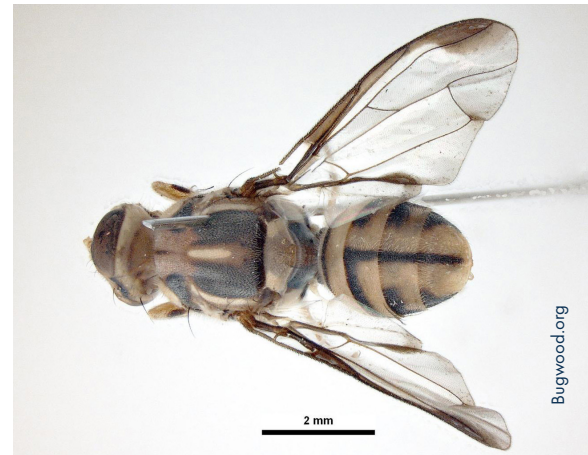
Two different insect families are both called fruit flies, the Drosophilidae or vinegar flies, and the larger Tephritidae or peacock flies. Common fruit flies include important model organisms like *Drosophila melanogaster* and many other decomposers. There are several species that are agricultural pests. The invasive drosophilid, spotted wing drosophila (*Drosophila suzukii*), is a pest of thin-skinned fruits including cherries, grapes, plums, raspberries, and strawberries. Adults have been trapped in Utah from late September to early November. Unlike other drosophilids, females can lay eggs in unripe or ripening fruit because they have a saw-like ovipositor.

The Tephritidae is a diverse fruit fly family with many important agricultural pests. Pests found in Utah include western cherry fruit fly (the primary pest of cherries), apple maggot (rare in Utah), and walnut husk fly. These pest flies (*Rhagoletis* spp.) are close to a quarter inch long and have dark colored bodies with black zig-zags on their wings. Management involves trapping for these pests starting mid to late June and applying insecticides for their control. The maggots of these flies deform fruits and impact fruit development.

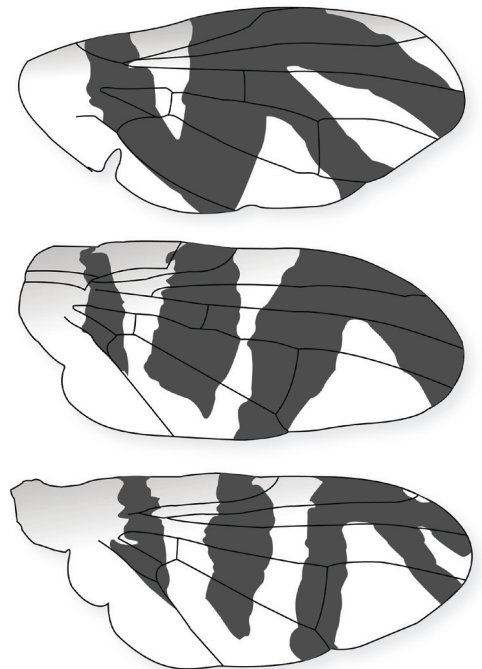
In July 2023, The Tau fly, *Zeugodacus tau*, was discovered in Los Angeles county, California. This fly, originally from Asia, is a pest of many different vegetable crops and prefers cucumbers, melons, pumpkins, and squashes. However, it is also a pest of cabbage, cherry, peppers, and tomatoes. It can be identified by the yellow body and the thin black "T" on the abdomen. The Tau fly has been accidentally introduced to California several times previously, but each historic introduction has been successfully eradicated. This recent introduction caused the first-of-its-kind quarantine in a southern California neighborhood in the Santa Clarita area. If this pest becomes established and spreads, it could threaten Utah vegetable production.

For more information on fruit flies:

- Spotted wing drosophila: <https://extension.usu.edu/pests/research/spotted-wing-drosophila>
- Apple maggot: <https://extension.usu.edu/pests/research/apple-maggot>
- Walnut husk fly: <https://extension.usu.edu/pests/research/walnut-husk-fly>
- Tau Fly: https://www.cdffa.ca.gov/plant/PDEP/target_pest_disease_profiles/tau_ff_profile.html
- CA fruit fly quarantine information: https://www.cdffa.ca.gov/plant/PE/InteriorExclusion/current_ff_erad.html



Adult Tau fly.



Wing patterns of three tephritid fruit flies that occur in Utah: apple maggot (top), walnut husk fly (middle), and western cherry fruit fly (bottom).

Alexander Knudson, Former Arthropod Diagnostician

IPM In The News

Tree Species Diversity Reduces Pest Populations

Urban environments are often known to lack diversity as few species are chosen for aesthetic purposes. With this lack of diversity there is often an increase in pest populations. Research published in the journal *Urban Forestry & Urban Greening* tested this relationship by quantifying tree diversity and generalist insect predation in red maples in North Carolina. Their results found that red maples that were surrounded by many tree species hosted fewer pests compared to trees surrounded with less diversity. This study shows that supporting tree diversification may reduce the need to treat trees with chemicals to manage pests, while supporting tree health and beneficial insect conservation.

Natural Field Edges Benefit Agriculture and Wildlife

Field edges are known for producing less than average yield for crops, which can be a great loss to the farmer. In the longest running study of its kind, a project by the UK Centre for Ecology and Hydrology discovered that rewilding field edges can increase pollinator populations without reducing average crop yields. Some crops even showed an increased yield despite the loss of agricultural land for natural habitat creation. The long-term nature of this study shows us that these changes can bring long term benefits for both the farm and local wildlife.

Spittlebug has Record Number of Host Plants

The meadow spittlebug has been known to have a very diverse habitat range and a large range of host plants including many agricultural crops, through which it spreads disease.

Research published in the journal *PLOS ONE* combined previous data from published literature to fully understand the host range of the meadow spittlebug. The study found the spittlebug diet has a record breaking 1,300 species of host plants and thus has immense opportunity to spread disease across crops. These results will be important for future research to better understand how to control the spittlebug and the diseases it spreads.

Fighting Gray Mold with Sunflower Stems

Sunflower stems may contain disease resistant compounds that could help protect harvested fruit from mold. Researchers report in *Journal of Agricultural and Food Chemistry* that extracts from sunflower stems contain 17 diterpenoids, including four previously unknown compounds. Four of these compounds showed significant activity against gray mold by destroying the plasma membrane of the fungus. Another test showed that when wet with these extracts, almost half of tested blueberries were protected from mold growth. Therefore, sunflower stem extracts could be used as a natural biocontrol agent to prevent postharvest disease in fruit.

Venom Glands May be the Key for Wasps to Produce Galls

The Cynipidae family of wasps is known for producing galls. The purpose of galls has been well studied, though the mechanism that produces these galls has been a mystery. Researchers at Penn State University recently published a study in *Insect Systematics and Diversity* in which they investigated the anatomical differences in gall producing cynipids and non-gall producing cynipids. The team found that cynipids that induce galls have

large venom glands, where venom may be a key component in gall induction. Continuing research on this topic allows for important knowledge on gall inducing mechanisms and ways to potentially block these pathways.

A New Tool in the Fight Against Insecticide Resistance

Concerns have been rising that pests of major crops such as corn, soy, and cotton, could start developing a resistance to commercially available pesticides. This has motivated researchers to find an effective alternative. Researchers at Corteva Agriscience have solved the structure of a novel insecticidal protein that is naturally produced by ferns. Their results showed that this protein was very effective against six of the major caterpillar pests of maize and soybeans even when they were resistant to commercial pesticides. The discovery of these proteins offers a promise for the development of new tools as a solution to pest resistance.

Hemp Cannabinoids Could Protect Plants

Past research on hemp cannabinoids has primarily focused on their intoxicating and medical implications, but it is not well understood why cannabinoids initially evolved in these plants. Researchers have hypothesized that hemp plants use these cannabinoids to protect themselves from pathogens and herbivory. A Cornell University study found that leaves with higher concentrations of cannabinoids had less damage from leaf-chewing insects than leaves with low cannabinoid levels. These results show potential for a cannabinoid derived pesticide, though more research is needed to its efficacy and potential ecological effects.

Featured Picture of the Quarter



This pretty gall on a willow stem is likely caused by *Aculops aenigma*, a native mite in the family Eriophyidae. Very little is known about this genus, even though new species are constantly being discovered. *Aculops* mites are tiny and cannot be seen with the naked eye. In fact, they were recently found to have the smallest known arthropod genome to date, containing 32.5 megabase pairs (Mbp), compared to 90 Mbp in the two-spotted spider mite (the previous winner). Even with such a small size and genome, the *Aculops aenigma* is still able to manipulate the host's defense mechanisms and scientists do not know how.

Image by Marion Murray, IPM Specialist

New Publications, Websites, Apps, and More

[Spotted Cucumber Beetle: New Guide Profiles Crop Damage, Management for Polyphagous North American Pest](#) is a new guide for the understudied spotted cucumber beetle's ecology and behavior, including management tactics in several key crops.

[New comprehensive crop disease reference book edited by AgCenter scientists](#) is a 400-page reference guide with detailed disease symptoms

of 22 major field crops designed to aid students, crop consultants, and producers for decades to come.

[E-commerce: A guide to managing the pest risk posed by goods ordered online and distributed through postal and courier pathways](#) is a new publication to help contracting parties predict and manage the threats and challenges posed by online trading of plants and plant products.

[New online toolbox for Integrated Pest Management knowledge sharing](#) was launched as an interactive, online library of IPM resources designed for farmers and advisors with topics including alternative agronomic practices, decision support systems, case studies, economic analysis, training guides, and links to past and current IPM initiatives.

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