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UTAH PESTS QUARTERLY

NEWSLETTER

Utah Plant Pest Diagnostic Laboratory

USU Extension

IN THIS ISSUE

NEW MEDIA

Extension
UtahStateUniversity.

Tumbleweed-feeding Insect New to North America Found in Utah

A *Centrocoris volxemi* individual sitting (and camouflaged) on a dead kochia plant.

In early fall 2020, a homeowner near Salt Lake City, Utah submitted a photograph of an insect to the Utah Plant Pest Diagnostic Lab (UPPDL) for identification. I had never seen the insect species before, and the homeowner indicated that it was abundant around the property. I was able to determine that it was a type of leaf-footed bug in the insect family Coreidae, but something about it seemed off.

The somewhat large, nondescript insect was light brown with alternating bands of black and light brown on the margin of the abdomen. It also had two small "lappets" on the thorax that extended slightly over the abdomen. After some digging online, I noticed a similar-looking species found in California, *Centrocoris variegatus*, that is native to parts of the Mediterranean. Expecting it to be this species, I attempted to get a physical specimen for a more accurate identification but was unsuccessful at the time.

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Fast forward to the summer of 2021 when I had nearly forgotten about this inquiry. A work colleague visits me on an otherwise normal afternoon and hands me a vial containing this very same unidentified insect. The delivered specimen was seen flying into a plot of asparagus in Tremonton, Utah. I knew right then that the insect had never been officially documented in Utah. The UPPDL made a preliminary identification and submitted it to our federal partners for confirmation, which is standard procedure for new arrivals of non-native species.

Original image of the "unidentified bug" sent to the Utah Plant Pest Diagnostic Lab in fall 2020.

The insect was identified as *Centrocoris volxemi*, a species with no common name. It is a different species than the one found in California, but is a close relative in the same genus. Not only had it never been officially documented in Utah, this was its first report for the United States.

The UPPDL was concerned about potential impacts to crops with the first specimen being found in asparagus. After searching for the insect throughout numerous Utah locations, we noticed that it only seems to feed on Russian thistle (a non-native plant that becomes tumbleweed) and concluded that the individuals found in asparagus likely flew from one of the many Russian thistle plants nearby.

To date, there is fortunately no indication that this insect feeds on Utah's crops or ornamental plants. It has primarily been found feeding on Russian thistle and resting on dead kochia plants (possibly for camouflage). There are signs that this insect may aggregate on human structures for overwintering, but more investigation is needed. Our findings indicate that *Centrocoris volxemi* has likely established throughout Utah and perhaps the Intermountain West, as specimens have been found as far south as St. George and north into Idaho.

If you see this insect, rest assured that it cannot cause harm to humans. If you notice this insect on any fruits, vegetables, ornamental plants, or on or inside your home, report this information to the UPPDL with your location, as it could be valuable in helping us learn more about the insect's preferences, distribution, and life cycle.

—— Zach Schumm, Arthropod Diagnostician

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The Cactus Moth: A Prickly Portent

The cactus moth (*Cactoblastis cactorum*) is an invasive South American pest that threatens native, endangered, and ornamental prickly pear cacti (*Opuntia* spp.) in parts of North America. This moth, also known as the Argentine cactus moth, is so damaging of prickly pear cacti that it has been used as a biocontrol agent around the world where these cacti are invasive, including Australia, South Africa, several Caribbean islands, and Hawaii. The cactus moth was first detected in the U.S. in 1989 in the Florida Keys, likely having hitchhiked from the Caribbean, and has since spread to isolated areas up the eastern seaboard to North Carolina and west to Texas (CERIS, 2022). This pest has not been detected in Utah, and a federal quarantine restricts the movement of regulated articles from affected areas to limit the spread of the moth.

Although the prickly pear cactus commonly evokes images of Mexican deserts and the American Southwest, these cacti are native to all 50 U.S. states, and about half of the more than 30 North American species occur here in Utah (Intermountain Region Herbarium Network, 2022). These cacti are important for stabilizing soils and slopes and for providing water, food, and/or shelter for many vertebrates such as deer, rabbits, coyotes, hummingbirds, quail, cactus wrens, lizards, desert tortoises, and bats, as well as invertebrates including bees, moths, and other insect pollinators. Opuntia fruits are also a human food source in many countries. In addition, cultivated Opuntia varieties are used in landscaping and container gardens.

Adults are nondescript brownish-gray moths with long legs and antennae and a wingspan of about an inch. The caterpillars (larvae) are about 1 inch long when mature, and colors range from pinkish when young to orange with black spots or bands when mature (Habeck et al., 2016).

Mated female moths lay between 30 and 50 eggs on a spine-like chain placed on a cactus spine, pad (cladode), or fruit, and the developing caterpillars bore into the pad to feed for up to 4 months. Mature larvae form a cocoon and pupate in debris under the host plant. Each female moth can reproduce up to four times during her 10-day life span.

Feeding damage from caterpillars results in a hollow, yellow pad that oozes plant fluid and insect waste (frass). Over

Top: *Cactoblastis cactorum* moth on *Opuntia* spp.

Bottom: Larval feeding damage.

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Larvae on *Opuntia* spp. and feeding damage.

Spine-like egg "sticks" on *Opuntia* spp.

the course of a day, a single caterpillar can consume an entire Opuntia pad, and entire plants can die when enough pads are affected. Although tougher "skinned" Opuntia cacti, such as *O. engelmanii* var. *lindheimeri* and *O. macrocentra*, have been shown to perform better than thinner-skinned Opuntia (Habeck et al., 2016), all Opuntia cacti are susceptible hosts (Morrison et al., 2020).

Eradication efforts have involved removing infested plants and releasing sterilized males to disrupt reproduction and slow the spread of this pest, but these efforts have been limited by expense and site accessibility in some areas. Chemical control of this moth has been unsuccessful, as the caterpillars are protected within the cactus pad, and the cacti are sensitive to chemical applications. A small Argentinian wasp parasitoid (*Apanteles opuntiarum*) that keeps populations in check in the cactus moth's native range is currently being investigated as a potential biocontrol agent (FDACS, n.d.).

Contact the UPPDL with suspicious sightings of this pest. Early detection helps state and federal authorities in Utah manage pests, and citizen involvement is key to program success.

Ann Mull, Research Technician, and Lori Spears, USU Invasive Species Specialist

For more information

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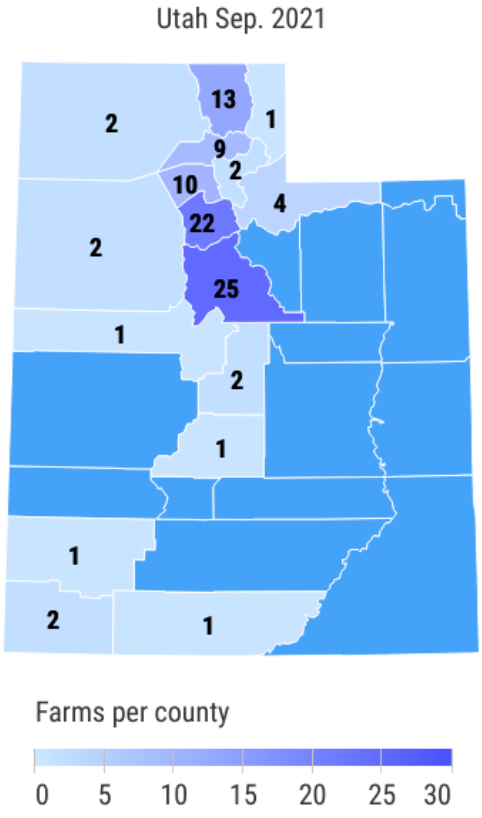
Cut Flower Crops and Programming Rapidly Growing Across Utah

Dr. Melanie Stock is Utah State University's Urban & Small Farms Extension Specialist. She focuses on high-value crops and resource use efficiency to improve the economic viability of small farms. She also helped found the Utah Cut Flower Farm Association. More information about her work can be found on her Instagram (@usu_smallfarms) or her USU Small Farms website.

Cut flowers are a dynamic new crop in Utah that are redefining profit margins for small farms. Depending on the flower crop grown and the production practices followed, net returns can average $2.50 per square foot (e.g. Lewis et al. 2021), as opposed to $0.17 per square foot for mixed vegetables (Curtis et al., 2015). The number of cut flower growers has increased by 20 to 30 farms per year since 2018, most of which are also new businesses for the state. As of fall 2021, there were 105 flower growers across 14 counties in Utah, with most concentrated along the Wasatch Front and classified as microfarms. The Utah Cut Flower Farm Association (UCFFA) established in 2019 as a certified nonprofit and currently has 125 members. In fall 2021, Dr. Ruby Ward's graduate-level economics class surveyed cut flower farms and modeled economic impacts. They discovered Utah cut flowers were a $1.6 M industry and with each dollar spent on this crop, an additional $0.80 was added to the economy.

Reasons for the growth in cut flower farms include consumer desire to support local ("grown, not flown") and sustainable farming practices ("farm to vase"), the unique selection, and the longer vase life. Local sourcing is also increasing on wholesale markets, for similar reasons. According to a 2021 florist survey by Curtis, Stock, and the UCFFA, local blooms benefit business by providing a higher quality product compared to imports, a reliable and event-ready supply, and promotional aspects associated with supporting local and sustainable practices.

Florists also emphasized increasing local flowers in their business. For 2022, 73% of florists wanted to source at least 25% locally grown flowers, 49% wanted at least 50% locally grown (up from sourcing 10% or fewer in 2021), and 63% were willing to pay a premium above



Number of cut flower farms by county in Utah, as of September 2021. Darker shades of purple indicate a greater number of farms in the county.

wholesale rates. The main barrier was the limited supply that farmers could provide, which highlights the strong market for this new industry, as well as the need to grow it.

To increase supply in Utah, balancing production around challenging growing conditions, misinformation online, and pest and disease pressure – is key. Most cultivation

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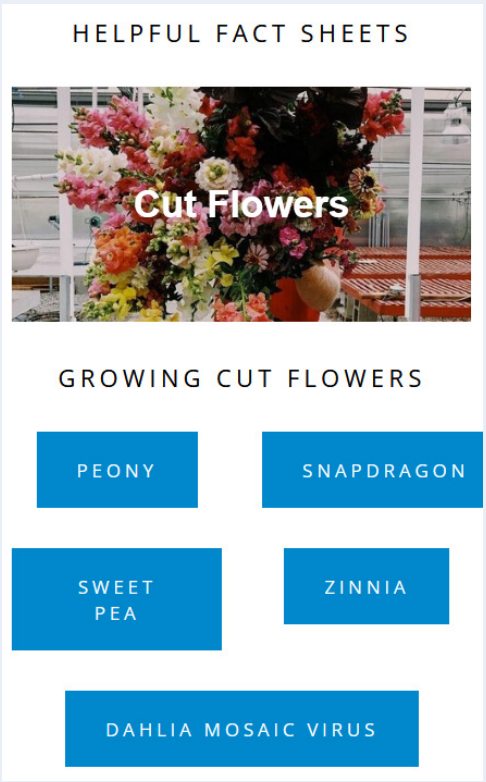
The USU Small Farms Lab is developing online curricula that describe locally adapted flower cultivars, optimal planting dates, season extension practices, and sustainable nutrient, soil, and water management.



guides come from the U.S. coasts, the traditional cut flower hubs. Utah has nearly opposite conditions, so following out-of-state information reduces returns. For example, the coasts are low elevation with humid and warm climates, and acidic soils that leach nutrients, require lime to increase pH, and high fertilizer rates to replace losses. In Utah's high elevation and semi-arid climate, growers face long winters, intense sunlight, damaging winds, strong daily temperature swings, alkaline soils with strong nutrient and salt retention, and water shortages. The most common setback found on farms is heavy nutrient and compost application that leads to excessively high soil nutrient levels and salinity that stunts growth. Regular soil testing, decreasing application rates, and diversifying amendments increases yield quantity and quality.

Disease also reduces production, and as a result, we are excited to have a close partnership with Dr. Claudia Nischwitz's plant pathology lab at USU. Many diseases have not yet been identified on cut flower crops in Utah and Dr. Nischwitz is leading efforts in their identification and distribution. We are especially interested in dahlias, which command premium pricing and are the top local

Growing dahlias in a high tunnel at the Utah Agriculture Experiment Station Greenville Research Farm in North Logan, Utah, in 2021 extended production by nine weeks and increased marketable yields by 45 to 200%, depending on the cultivar, compared to field production.

crop requested by florists, but are prone to virus infection. Viruses reduce production, but sourcing clean stock and identifying infection can be difficult. Dahlia mosaic virus has been exceptionally prevalent in Utah since testing began (USU, 2021). Our surveys found that plants range from asymptomatic, to stunted, to exhibiting mosaics or necrotic lesions, with certain cultivars more prone to symptoms. Through grants, we offer free testing to cut flower farms in Utah, as well as on-farm surveys for disease. For growers interested in sending plant samples or requesting a farm visit, please email Dr. Claudia Nischwitz (claudia.nischwitz@usu.edu) or Dr. Melanie Stock (melanie.stock@usu.edu) with your farm's name, address, main cut flower crops, and pictures of concerning plants.

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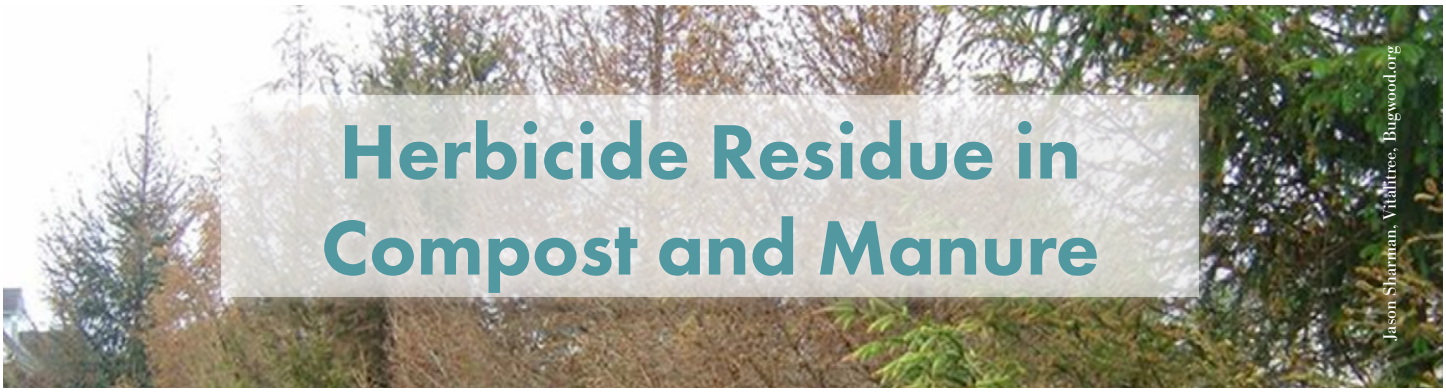

Herbicide Residue in Compost and Manure

Every year, photos and samples are submitted to the Utah Plant Pest Diagnostic lab of vegetables and ornamentals that are either dying or showing distorted growth or branch dieback resembling herbicide damage. Symptoms may not show up on all plants at the site, and some plants are more susceptible to herbicide damage than others. Among the most sensitive are beans, tomato, potato, pepper, peas, grape, and dahlias and other flowers.

In the spring, we also get inquiries about seedlings either not emerging at all or dying soon after emergence. Often, we cannot find any plant pathogens on the symptomatic plants. The focus then moves to materials that have been applied around the yard. Clients frequently indicate that no herbicides were applied but that they used compost or manure in their yard.

Herbicides especially in the pyridine carboxylic acid or phenoxy classes that are used to control broadleaf weeds in pastures and lawns break down very slowly in manure and compost. In some cases, residual herbicide can still be detected three years later, especially in hay. Some herbicides from treated pasture consumed by livestock can pass through the digestive tract and into the manure. When contaminated manure is applied on garden soil, the residual herbicide can leach into the ground with irrigation water and damage the plants. Similarly, herbicides on treated grass will not break down quickly when grass clippings are composted.

To avoid accidental herbicide exposure of plants in your yard, it is important to know what is in the compost you use or if the manure comes from livestock that fed on treated pastures. If you make your own compost, use only plant material that you know has not been treated with herbicides, especially grass clippings.

— Claudia Nischwitz, Plant Pathologist

Arthropods take on Weeds in Grand County

The tamarisk leaf beetle has been released as a biocontrol agent to manage invasive tamarisk (salt-cedar) along the Colorado river's riparian zones since the early 2000s.

Located along Utah's eastern border with Colorado, Grand County has high rates of tourism and natural resource use that requires local land managers to think critically in sustainable preservation practices of this delicate landscape. Elizabeth (Izzi) Weimholt takes on these challenges through her role as the Grand County Weed Supervisor. Left unchecked, invasive noxious weeds can spread rapidly and cause major economic losses. One tactic that Izzi and her team implement is biocontrol via the release of herbivorous arthropods to suppress the weeds.

The puncturevine seed weevil is a biocontrol that feeds on seeds of puncturevine.

The **tamarisk** or **salt-cedar leaf beetle** (*Diorhabda elongate*) is about 5.5 mm long and dark yellow with brown markings while the larval stage is gray-black. Adult populations overwinter in the ground and become active in spring when tamarisk leaves begin emerging. They lay their eggs on the leaves and larvae feed extensively on the foliage, causing slow dieback of the tamarisk plants.

Izzi and her team are also investigating the release of **puncturevine seed weevil** (*Microlarinus lareynii*) to control puncturevine (*Tribulus terrestris*). The adult weevils are brown, 4-5mm long, and have stiff gray hairs. They lay their eggs into chewed pits of the spiny puncturevine seeds. Upon hatching, the cream-colored, c-shaped larvae feed into the seeds, preventing germination.

Similar to the puncturevine seed weevil, the **puncturevine stem weevil** (*Microlarinus lypriformis*) is also used to control puncturevines. Puncturevine stem weevils are slightly smaller and lay their eggs into the root crowns and underside of stems. When the eggs hatch, larvae mine the stem and root crowns, killing the weed.

Lastly, Izzy's team is investigating the use of the **bindweed gall mite** (*Aceria malherbae*) to combat field bindweed and hedge bindweed. These tiny, soft-bodied mites complete multiple generations each year. They form galls on various parts of the plant, causing stunted growth and reduced flowering.

These biological control options are primarily used on natural or agricultural lands. They are not typically available for use in home or residential settings. However, to learn more about whether your own county is using biocontrol for weeds, contact your local county weed supervisor or USU Extension office for further information.

Nick Volesky, Vegetable IPM Associate

For More Information

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The Boom of Microbial Biopesticides

Dipel, Javelin, Xentari - all names for a commonly used microbial biological pesticide, *Bacillus thuringiensis*. Bt has been used commercially since 1961, when it was first registered by the EPA.

Biopesticides represent a large grouping of about 1,500 registered products containing ingredients derived from natural sources such as animals, plants, bacteria, and minerals. For example, canola oil and baking soda have pesticidal applications and are considered biopesticides.

Many of these products successfully control a variety of insects and diseases in landscape and agricultural settings. In fact, the global market for biological pesticides is increasing every year, largely due to public demand.

Microbial biopesticides are made from animals, plants, and microorganisms such as bacteria, fungi, viruses, and other organisms (or their metabolites). They are sold as dusts, wettable powders, sprays, granules, etc. and are applied in the same way as conventional pesticides. Each separate active ingredient is relatively specific for its target pest(s). For example, there are fungi that control certain weeds and other fungi that kill specific insects.

Bacillus thuringiensis (Bt) is the most common organism used in microbial products. It is a bacterium that naturally occurs in soil and makes proteins that are toxic to larvae (caterpillars), and must be eaten by the larvae to be effective. Bt produces a protein that binds to larval gut receptors. This paralyzes the cells in the gut, interfering with normal digestion and triggering the insect to stop feeding on host plants. Death can occur within a few hours to a few weeks of Bt application, depending on the insect species and the amount of Bt. In contrast, when people eat the same toxins, the toxins are not activated and no harm occurs.

There are different strains of Bt, each with specific toxicity to particular types of insects: Bt *aizawai* (Bta) is used against wax moth larvae in honeycombs; Bt *israelensis* (Bti) is effective against immature mosquitoes, black flies and some midges; and Bt *kurstaki* (Btk) controls various types of lepidopterous insects (caterpillars), including the gypsy moth and cabbage looper.

The greatest advantage to using microbials is that they are safe for the environment. Most have a low toxicity to humans and other life not related to the target pest. Other advantages of these products are that they:

- Can be applied in locations where synthetic chemicals cannot be used such as near wetlands, schools, and in parks.
- Can be applied almost up to harvest date.
- Can be used in conjunction with synthetic chemical insecticides (follow the label directions).

There are a few cautions or downsides to using microbials, with the most important one being that they tend to be more expensive. Other cautions include:

- Some products require multiple
- applications, and correct timing of application is crucial.
- Most microbials a shorter shelf life than conventional products, and must be protected from exposure to UV light and excessive heat
- Most of the products that control insects must be ingested to be effective.
- As with conventional pesticides, it is important to rotate between modes of action to prevent resistance. One microbial-related product (made from metabolites of the bacteria), spinosad, is highly effective and highly used. But some pests such as diamondback moth and codling moth, have developed resistance in some areas of the world.

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Examples of some microbial pesticides for use in Utah

Inclusion of products in this list is not an endorsement.

Active Ingredient	Product Names - Commercial Use	Product Names - Home Use	Target Pest and Notes
BACTERIA			
Bacillus thuringiensis	Biobit, Foray, Xentari	Dipel, Thuricide, Safer Garden Dust	Targets foliage-feeding caterpillars; Degrades rapidly in sunlight; Apply in the evening or on overcast days and direct some spray to lower surfaces or leaves; Various strains available
Bacillus subtilis	Serenade, Cease, Rhapsody, Subtilix	Monterey Garden Fungicide	Targets many fungal- and bacterial-caused diseases including leaf spots, anthracnose, blights, powdery mildew, and root rots
Bacillus amyloliquefaciens	Double Nickel, Serifel		Targets fungal and bacterial plant pathogens such as fire blight and powdery mildew
Streptomyces lydicus	Actinovate		Targets a variety of root and foliar diseases including damping-off, alternaria leaf spot, pythium and phytophthora root rot, take-all, and verticillium
Aureobasidium pullulans	Blossom Protect		Targets the bacterium that causes fire blight
Pseudomonas fluorescens	Blightban		Targets fire blight, bunch rot, and botrytis rot
FUNGI			
Trichoderma spp.	Obtego, Root Shield, Tenet	Root Shield	Targets botrytis, root rots, powdery mildew
Beauveria bassiana	Botanigard, Mycotrol, Velifer		Targets aphids, fungus gnats, mealy bugs, mites, thrips, whiteflies
Myrothecium verrucaria	DiTera		Targets plant pest nematodes
PROTOZOA			
Nosema locustae	NOLO Bait	NOLO Bait	Targets grasshoppers and Mormon crickets; Useful for residential settings but must be applied while nymphs are young
VIRUSES			
Codling moth granulosis virus (GV)	Cyd-X	none	Targets codling moth caterpillars; Infected larvae will further spread the virus; Subject to rapid breakdown in ultraviolet light
Corn earworm polyhedral occlusion bodies	Madex	none	Targets corn earworm larvae

— Mair Murray, IPM Specialist

IPM In The News

Cancer-sniffing Ants Detect Disease

A new proof-of-concept study from a team of researchers in France suggests trained ants could be effective at detecting cancer in humans. The researchers demonstrated a certain species of ant can be quickly trained to detect cancerous cells with an accuracy equal to that seen in other animals with bio-detection abilities, such as dogs, as reported in *iScience*.

Discovery of New Mode of Action Against Insects

Ion channels in the insect nervous system are among the most important targets for insecticides. Understanding the structure of the channels is key for the identification of novel species-specific binding sites of the chemical. Researchers at the Max Planck Institute of Molecular Physiology in Germany have revealed in *Nature Communications*, the structure and function of a potassium ion channel in fruit flies. Their new insights reveal the differences between human and insect channels and explain how known compounds affect the channel. The research could help pesticide manufacturers design new ingredients that target specific pest insects without affecting other non-target animals like bees and mammals.

Nanocarrier Spray to Improve Crop Function

Developing transgenic plants takes time, money, and still has not gained widespread public support. Researchers at the RIKEN Center for Sustainable Resource Science in Japan report in the journal *ACS Nano* that they have developed a way to improve crop quality without needing to create genetically-modified plants. The new technique relies on a spray that introduces a bioactive compound into plant cells through their leaves. The new technology could be used to help crops resist pests or become more resistant to drought, in less time and at less cost than making lines of genetically-modified crops.

Bacterial Disease Forces Host Plant to Provide Food

Stewart's wilt is a corn disease prevalent in the central and northeastern U.S. caused by the bacterium, *Pantoea stewartii*. Recent research published in *Cell Host & Microbe* has discovered that the bacteria contains a protein called WtsE, that forces the plant to mobilize food and water into spaces where the bacteria reside. This action keeps the pathogen alive and thriving long before it starts to kill the plant's cells. The study lays groundwork for future studies to determine the mechanism behind the WtsE protein's manipulation of plant cells. These results can then be used to improve breeding of plants that are resistant to Stewart's wilt.

Mechanism of "Talking Plants" Discovered

Plants that are exposed to odors emitted from neighboring plants that are being fed on by pests can respond by developing defense mechanisms. Although scientists understand that the induction of the expression of defense genes in odor-responsive plants is key to this resistance, the precise molecular mechanisms for turning the induced state on or off have not been understood. A team of researchers from multiple Japanese research institutes, including Tokyo University of Science, studied these responses in the model plant, *Arabidopsis thaliana,* and published their findings in the journal *Plant Physiology*. They exposed plants to beta-ocimene, a volatile organic compound released by plants in response to herbivore feeding. The volatile chemical enhanced histone acetylation and the expression of defense gene regulators in the Arabidopsis, including the ethylene response factor genes "ERF8" and "ERF104." The team found that a specific set of histone acetyltransferase enzymes (HAC1, HAC5, and HAM1) were responsible for the induction and maintenance of the anti-herbivore properties.

Byproduct of Biofuel Has Insecticidal Properties

Biofuels are important tools for energy, but the byproducts have typically gone to waste. A team of researchers from the USDA in Kansas and Colorado, and Kansas State University, are investigating whether these byproducts could be used to manage agricultural and stored-product insect pests. The team tested several byproducts and reported their results in the *Journal of Economic Entomology*. They found that those that waste products from pyrolysis mimic the action of insect growth regulator pesticides. The oils were tested on the red flour beetle (*Tribolium castaneum*) and the confused flour beetle (*Tribolium confusum*) and caused deformities in normal development such as incomplete metamorphosis or only partial hardening of the pupal case. In the end, many of the exposed larvae never matured to adults. At higher concentrations, there was 100% suppression of larvae of both beetles. The authors conclude that the use of this type of biofuel byproduct is a climate-friendly pest management choice that can support IPM programs.

Featured Picture of the Quarter

Lacewing larvae are important predators of many insect pests. Although the adults can also be carnivorous on insects, they have a much more varied diet.

This adult is feeding on the white part of a bird dropping, likely attracted to the water and semi-liquid protein source. The white portion also contains uric acid, an insoluble compound rich in nitrogen.

Other important components of the adult lacewing's diet include insect honeydew, plant nectar and pollen, and fungal spores.

—— Image by Mair Murray, IPM Specialist

New Publications, Websites, Apps and More

University of California's Wildlife ID Tool helps narrow down potential vertebrate pests using signs such as damage, tracks, and droppings, and the results provide identification, biology, and management.

In the Western IPM Center's spring IPM Hour, watch the recorded webinar featuring Andony Melathopolis, an Assistant Professor of Pollinator Health at Oregon State University discuss IPM and Bee Health: Opportunities (and the Places Where They Work against One Another).

A new publication, IPM for Thousand Cankers Disease in Black Walnut, details the management of this disease in commercial orchards in the Pacific Northwest.

In a University of California Ag Experts Talk, learn about management of viruses in vegetable production.

The publication Reaching Women in Agriculture: A Guide to Virtual Engagement by the American Farmland Trust and SARE, provides information, tips, and tools for effective engagement for online education.

Clipart courtesy of FCIT

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NPDN National Plant Diagnostic Network

WPDN Western Plant Diagnostic Network

USDA United States Department of Agriculture National Institute of Food and Agriculture

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