

USU Fruit and Vegetable Field Day

Where: Kaysville Farm
950 South 50 West, Kaysville.

* Meet at the Kaysville Education Center parking lot; no preregistration required.

When: August 13, 2014 1:00-4:30 p.m.

Concurrent tracks on conventional and organic fruit and vegetable research, including the latest in high density orchards, cover crops, pest management, raspberry cultivars, and novel fruit harvest equipment.

Production Information

Preventing Sunscald on Fruits

Sunscald occurs on fruit that have been exposed to too much direct sunlight. Sunscald is often associated with plants that have leaf loss from a leaf spot disease or insect feeding, but can also be seen on plants that are over pruned. Affected areas are sunken, wrinkled and white in color. As the tissue dries, it becomes thin and papery and may get infected with secondary diseases.

Management:

Maintain a good leaf canopy by properly balancing plant growth through pruning, fertilization, irrigation, and pest control. Appropriate plant spacing and regular nitrogen (N) applications ensures plants produce sufficient foliage to cover or shade the fruits which helps minimize sunscald. Row covers or shade cloths may also help shield fruits from direct sunlight.



Sunscald on pepper

Diseases such as powdery mildew can cause significant defoliation, so select plant varieties that show some level of

tolerance to powdery mildew and other defoliating diseases whenever possible and manage diseases properly, especially during periods of high disease pressure.

Use caution when harvesting fruits so that leaves or stems don't get cut or broken. Damage leaves and stems can cause the remaining fruit to be exposed to the sun.

Disease Information

Blossom-end Rot

Blossom-end rot (BER) occurs when there is a calcium deficiency in plants. It first appears as a water-soaked spot on the bottom of the fruit. The spot first turns brown and eventually turns black as fruit size increases. Blossom-end rot can appear on fruit in any stage of development, but it is most common when fruits are one-third to one-half grown. The first fruit produced by the plant are often most severely affected. Fruits that develop later in the season on the same plant can be unaffected.



BER symptoms on tomato (top left), squash (top right), melon (bottom left), and pepper (bottom right).

Blossom-end rot occurs when plants are unable to translocate enough calcium to the fruit and may occur even if there is sufficient calcium in the soil. BER is caused by fluctuating soil moisture (drought and overwatering), excessive heat, root pruning during cultivation, or from excessive nitrogen fertilizer applications.

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Management:

Blossom-end rot can be minimized by maintaining a uniform supply of moisture through regular watering and soil mulches, applying appropriate applications of fertilizers (soil tests will help you know how much fertilizer is needed), and avoiding root injury by not cultivating within 1 foot of the base of the plant.

Chemical Treatment:

Foliar sprays of anhydrous calcium chloride can reduce symptoms during the growing season.

Curly Top Disease

Several tomato plants are exhibiting curling leaves in many areas which may be mistaken as curly top disease.

Curly top disease is caused by the beet curly top virus and is vectored or spread by the beet leafhopper. Tomato plants infected with curly top are stunted and have upwards curled, yellow leaves. The veins on the underside of tomato leaves are purple.



Curly top causes plants to be stunted.



Curly top causes yellow leaves and purple veins.

Infected plants may not produce fruit, or fruit that develops will ripen prematurely. While older plants are less susceptible to the virus, plants that are infected at an early stage may die. To confirm curly top disease in plants they need to be analyzed in a lab.

Management:

Management of curly top disease is challenging in part because there are no resistant tomato varieties available, but these suggestions may help reduced disease incidence.

- Delay planting until after migration of leafhoppers has moved through (one or two weeks) this can reduce disease incidence significantly, depending on the area.

- Weeds can serve as overwintering hosts for beet leafhopper so it's important to control them throughout the growing season.
- Use dense plant spacing which will make it more difficult for the leafhoppers to find the plants and will decrease the probability that the leafhoppers will feed on and infect all the plants. This would allow virus-free tomatoes to fill out the area where infected plants have died out.
- Use row covers for the first 6-8 weeks of planting to exclude leafhoppers.
- Use intercropping or trap crops. Leafhoppers are attracted to plants that highly contrast with their surroundings.

NOTE: Accurate plant diagnosis is essential before management practices are initiated. Since abiotic disorders can cause symptoms very similar to curly top (an infectious disease), it is important to treat the cause of the symptoms. If you suspect your plants are infected with curly top you can send pictures and/or a sample to the Utah Plant Pest Diagnostic Lab (UPPDL) for diagnosis. See <http://utahpests.usu.edu/uppd/htm/forms> for instructions on how to submit samples.

Insect Information

Squash Bug Update

Squash bug nymphs are now starting to hatch in some areas. Remember eggs are the easiest to treat so continue to monitor and remove eggs when you see them.



Heavy adult feeding can cause wilting (known as "sudden wilt") leading to death of leaves or entire plants.

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Duct tape is a non-destructive method for removing eggs and preventing eggs from hatching.



Smothering squash bug eggs with petroleum jelly will also prevent egg hatch.



If nymphs are seen, they can be shaken off plants into a bucket of soapy water. Insecticides can also be used to treat squash bug nymphs.

Chemical Treatment Options:

While plants are in bloom, spray only in early morning or evening to avoid harming pollinators.

Commercial growers: acetamiprid (Assail), esfenvalerate (Asana), permethrin (Ambush, Pounce), bifenthrin (Tundra), Carbaryl (Sevin), lambda-cyhalothrin (Warrior).

Residential growers: neem oil (Concern, Ferti-lome), permethrin, (Ace Dust, Bayer Advanced Dust, Bonide Eight), kaolin clay (Surround), carbaryl (carbaryl can cause plant damage [phytotoxicity] when applied in hot weather).

Earwigs

Adults overwinter in the soil as brooding pairs or above ground in aggregations. Females lay eggs in clutches of 30-50 eggs in the spring within nests in the soil; they may lay more than one clutch if resources are sufficient. Egg hatch begins around mid-May in northern Utah. The young nymphs (immature earwigs) remain in the nest where the mother protects them from hazards and maintains the nest by removing mold. The older nymphs disperse from the nest in search of food.



Earwig nymphs don't have wings.

Adult males have strongly curved pinchers.

Pinchers on females are not as curved as male pinchers.

Earwigs are active during the night (nocturnal) and hide in dark, tight, and moist places during the day. Pheromones from frass (feces) and exoskeleton chemicals attract earwigs to congregate. There are two or more generations per year, and populations tend to build to their highest densities in mid to late summer. See The Utah Vegetable Production and Pest Management Guide for more detailed description of earwig life stages.

Feeding/Damage

European earwigs are omnivores, feeding on a diverse diet including many types of plants, fungal spores, small

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invertebrate animals, and decaying organic matter. They also prey on soft bodied plant pests such as aphids, scales, caterpillars, maggots and mites. The European earwig becomes a problem when it feeds on seedling plants and in corn, when it feeds on the silk, preventing pollination and causing poorly developed ears that have many kernels missing on the cobs.



J. G. Davis, Bugwood.org

Management

Since European earwigs can be both beneficial (eat other pest insects) and detrimental to crops, control measures should only be applied if there is unacceptable crop damage.

- **Use Traps.** Trapping earwigs can be an effective way to monitor and reduce earwig numbers. Some of the various types of traps that can be used include:
 - Corrugated cardboard rolled and tied to stakes along borders or dispersed throughout the field.
 - Rolled or crumpled moistened newspaper.
 - Grooved wood placed together.
 - Tuna cans, yogurt or sour cream containers (punch holes in lids). Bait containers with smelly oils such as fish or clam oil, bacon grease, and wheat bran or wheat germ and then bury the bottom of containers in the ground.



- **Check traps twice per week.** Transfer live earwigs into a plastic container with soapy water for disposal. If using bait, replenish as needed.
- **Reduce or remove nesting and hiding places.** Earwigs seek refuge in dark areas during the day. Weeds,

plant debris, and volunteer corn plants should be kept clear from fields, especially in the spring.

Chemical Treatment Options:

Insecticides should be applied in the late evening just before earwigs come out to feed. Target sites where earwigs congregate (sites where females brood their young), and on plants when injury appears.

Commercial growers: piperonyl butoxide + pyrethrins (Evergreen), pyrethrins (Pyganic), pyrethrins + azadirachtin (Azera).

Residential growers: bifenthrin (Bug B Gon), lambda-cyhalothrin (Triazicide Insect Killer), pyrethrins + sulfur (Natria Insect, Disease, and Mite Control), spinosad (Sluggo Plus), insecticidal soap (safer's, Natural Guard, Bayer Natria).

Spider Mites

Spider mites are building in numbers in a variety of crops, including melons, eggplant, beans, and more. Mites are small arthropods that are more closely related to spiders and ticks than to insects. When conditions are hot, dry, and dusty, a complete generation from egg to adult may take as few as 7 days, allowing them to build from a few to many hundred on a single plant. If mites are treated when population size is small, they will not become too much of a problem. Start monitoring now, by checking the undersides of leaves for a "dirty" appearance (a 20x hand lens may be needed to aid scouting).



Spider mite egg Adult spider mite

Feeding/Damage

As mites feed, they suck the chlorophyll from plant cells, causing stippling on the leaf surface. Severe infestations result in leaf burn, leaf distortion, and reduced yields.



Stippling damage caused by spider mite feeding

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Management

Various insects and predatory mites feed on spider mites and provide a high level of natural control. One group of small, dark-colored lady beetles known as the “spider mite destroyers” are specialized predators of spider mites. Minute pirate bugs, big-eyed bugs and predatory thrips can also be important natural enemies.



Adequate watering of plants during dry conditions can limit the importance of drought stress on spider mite outbreaks. Periodic hosing of plants with a forceful jet of water can physically remove and kill many mites, as well as remove the dust that collects on foliage and interferes with mite predators. Disruption of the webbing also may delay egg laying until new webbing is produced. Sometimes, small changes where mite-susceptible plants are located or how they are watered can greatly influence their susceptibility to spider mite damage.

Chemical Treatment Options:

Some pesticides, such as pyrethroids, carbaryl, and imidacloprid, can actually increase spider mites by killing predators or by increasing the reproductive rate of the mites. When treating mites, choose products that are targeted specifically toward these pests.

Commercial growers: Kelthane, Aldicarb, Acramite, Apollo, Biomite.

Residential growers: oils: neem, horticulture, canola, etc (Fertilome Triple Action, Green Light, Bayer Natria, Monterey), insecticidal soap (Safer’s, Natural Guard, Bayer Nutria), sulfur (Bayer Natria [do not use oil, soap, or sulfur at temps over 85°F]).

Lygus Bugs

Lygus bugs (also known as the tarnished plant bug) are abundant in some areas in the state right now. They overwinter as adults, and can be found in dead weeds, leaf litter, under tree bark, in rock piles in fields, stream and ditch banks, and road rights-of-way. Adults become active in early spring and feed on newly developing buds and shoots. Eggs are often deposited in leaf petioles or at the base of the leaf blade. Yellowish-green nymphs emerge after 7 to 10 days of eggs being laid, and begin feeding. Their life cycle



is completed in three to four weeks, and there are two to three generations per year.

Feeding/Damage

The lygus bug feeds on a variety of hosts including carrots, lima and snap beans, soybeans, and tomatoes. The lygus bug is among the most damaging of the true bugs and is known to vector the bacterial disease, fire blight, to various fruits through feeding wounds.

Lygus bugs use their needle-like mouthparts to extract plant juices. Their feeding causes shriveled seeds in carrot and premature drop of buds, flowers and fruits in tomato. Leaves from damaged buds are sometimes ragged and discolored. On cauliflower, the lygus bug can feed on many individual flower buds, causing bronzing on the head.



Management

The removal of preferred host plants from edges of fields and destruction of favorable overwintering sites will help to reduce the damages caused by the lygus bug. Preventing weeds from forming young buds and flowers will keep populations lower in the weedy areas. Once weeds flower and lygus bugs colonize them, the bugs will tend to remain in the weeds unless the weeds start to senesce, dry, or are mowed. Weed hosts include butterweed, fleabane, goldenrod, vetch, dock, and dog fennel.

Once the adults move into a crop, the type of management depends on the crop growth stage. When plants are vegetative, low densities can be tolerated. As plants begin to set buds, chemical controls may be needed. However, chemicals will have no effect on the egg stage inside of the plant tissue.

Chemical Treatment Options:

Insecticides effective against lygus bugs:

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Commercial growers: azadirachtin (Aza-direct, Ecozin, Molt), bifenthrin + imidacloprid (Brigadier, Swagger), zeta-cypermethrin (Gladiator, Mustang).

Residential growers: oils (Monterey All Natural Garden Insect Spray), pyrethrins + piperonyl butoxide (Worry Free Insecticide and Miticide), lambda-cyhalothrin (Spectracide Triazicide).

Cereal Leaf Beetle

Cereal leaf beetle adults are active in some areas of Utah. The cereal leaf beetle is native to Europe and has been considered a pest of small grains since 1737. Since the first detection in Utah, beetles have been confirmed in 16 counties, although only considered established in Box Elder, Cache and Weber counties.



Adult cereal leaf beetles have metallic bluish-black heads and wing covers. Their thorax and legs are orange to reddish brown.

In the spring, adults prefer late-planted and thinly sown small grain fields to lay eggs. Eggs hatch in about 5 days and larvae develop in 10 to 12 days. Mature larvae will pupate in the soil and after a short period, a new summer generation of adult beetles emerge in late-May and June. New beetles move from small grain fields and feed on grass plants, including corn, in areas adjacent to the small grain fields. Adults overwinter in fallen leaves, ground litter, or other debris, within wooded areas, or other protected sites in the vicinity of last season's grain fields. There is one generation per year.

Feeding/Damage

The cereal leaf beetle feeds on a wide range of host grasses, both in the larval and adult stages. This insect prefers spring-seeded small grains, especially barley, wheat, and oats, but will also feed on spelt, wild oats, orchardgrass, timothy canarygrass, reed canarygrass, annual ryegrass, perennial ryegrass, foxtail, and fescues. Adult cereal leaf beetles may feed on the leaves of corn, sorghum, and sudangrass. Young, small larvae eat very little, but when full grown have

a voracious appetite and can cause economic damage to small grains from feeding on leaves. Adults will feed on young small grain plants and other grasses like corn, but their feeding does not affect the plant's performance. Adult feeding on corn usually doesn't cause yield reductions.



Adult feeding on corn appears like several line-etchings on the leaf blades.

Management

Although adult cereal leaf beetles are out right now, they do not lay eggs in corn plants and damage from their feeding is usually minimal. Adults are inactive most of the summer, so chemical treatment may not be very effective or needed. In the fall the cereal leaf beetle adults move to overwintering sites so it's important to make sure you're your garden is free of plant debris, especially if you garden is near commercial small grain fields.

A wasp that lays eggs inside young larva and eventually kills them once they pupate in the soil may be disturbed from cultivating, so in small grain fields, leave some areas of the grain field (e.g., field margins or islands within the field) untilled, if possible, for a year after harvest if planting grain again the following year. This will increase parasitism of cereal leaf beetle larvae in the same field the next year, as well as increase dispersal of the parasitic wasp adults to other nearby fields of small grains. In the spring make sure to monitor for the presence of cereal leaf beetle larvae.

Chemical Treatment Options:

Insecticides effective against cereal leaf beetle in corn:

Commercial growers: bifenthrin (Brigade, Discipline, Fanfare, Hero), chlorpyrifos (Bolton, Stallion).

Residential growers: lambda-cyhalothrin (Spectracide Triazicide), permethrin (Monterey Aphid and Whitefly Spray).

Natural Enemies Spotlight

Lady Beetles

Lady beetles (ladybugs, ladybird beetles) are perhaps one of the most recognizable predators. Their eggs and voracious larvae, however, are often overlooked. Most lady beetles overwinter as adults in protected sites. When they come out in the spring, they are attracted to trees and plants that have colonies of aphids and other soft bodied insects. Females fly to these areas to lay their bright, yellow eggs. When tiny larvae hatch they eat their eggshells, usually staying clumped together for about a day, before they crawl off in search of prey. Unlike lady beetle adults which can fly, the larvae are wingless and are more likely to stick around an area with insect prey to complete their development. Development from egg to adult takes 3 to 6 weeks and occurs many times in one season.



Lady beetle adults



Lady beetle eggs in aphid colony



Lady beetle larva



Lady beetle pupa

What They Feed On:

Lady beetles are important predators of mites and soft bodied insects such as aphids, scale crawlers, and mealybugs. Both the adults and larvae are predaceous in their feeding habits. Many species feed exclusively on aphids. Adults can consume 100 aphids per day. Larvae are active hunters that seek out their prey and kill them with their chewing mouthparts. The larvae have very large appetites and can attack large prey. Since adults and larvae feed ravenously on soft-bodied insects like aphids, they can be an effective suppressor of these pest populations and eliminate the need for insecticide treatments. Lady beetles also feed on pollen, nectar, or insect honeydew.

Appearance and Life Cycle:

Lady beetles have 4 developmental stages including egg, larva, pupa, and adult (also known as complete metamorphosis). Eggs are small, oval, and yellow. Larvae are elongated with an alligator appearance.

The three most common lady beetles in Utah are the native convergent lady beetle, transverse lady beetle, and the non-native seven-spotted lady beetle.

The **convergent lady beetle** is recognized by its distinctive pronotum (the back of the insect just below the head), which bears two white converging dashes that give the beetle its name. The convergent beetle is orange to red and may have as many as 12 spots, while some adults have no spots at all. Overwintering aggregation of thousands of convergent lady beetles are sometimes found in wooded areas in the fall and early spring. In the heat of late summer they often aggregate in cool places such as shady spots or along lake shores.



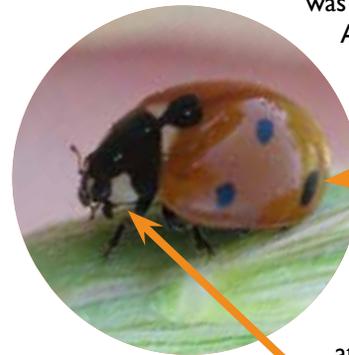
The **transverse lady beetle** has markings on its back that resemble ink drops that have slipped sideways, forming a black band close to the front.



Whitney Cranshaw, Colorado State University, Bugwood.org

The **seven-spotted lady beetle** is a large lady beetle that was introduced from Europe.

Adults are robust and nearly hemispherical. Each individual wing bears three spots with one central spot on the back of the beetle just below the head (pronotum) for a total of 7 spots. The central spot is often highlighted with hazy white at the front, and the black pronotum is marked at the front corners with white.

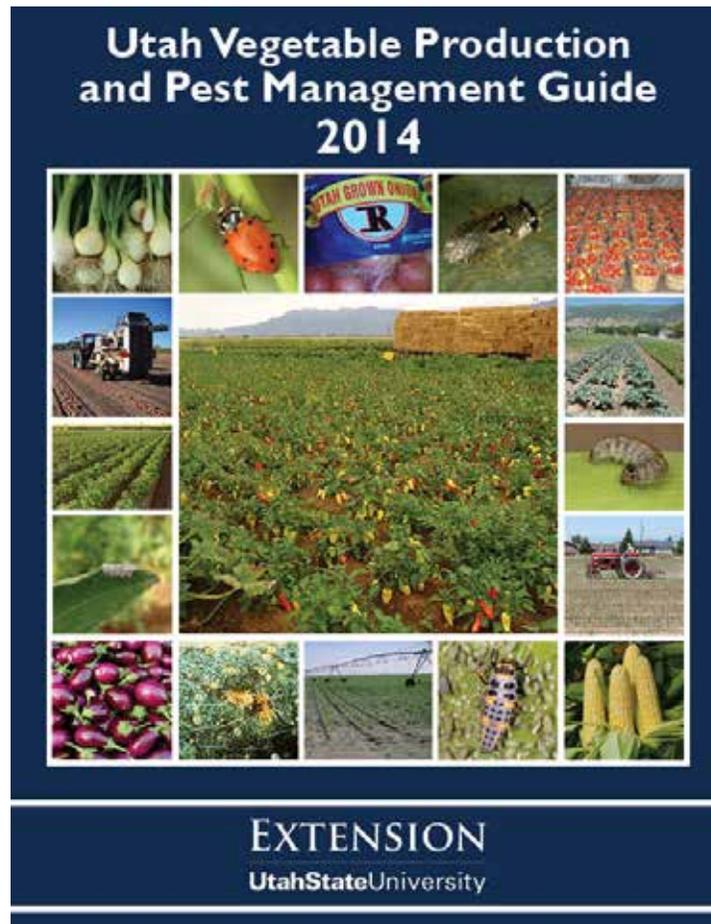


How To Attract Them:

Lady beetles will be attracted to places that provide their basic needs such as food and shelter. To help entice lady beetles to your garden grow plants that provide food such as angelica, caraway, cosmos, dill, fennel, and marigold. Mulches and low-growing plants like thyme or oregano can provide lady beetles and other beneficial insects protection from other larger predators like birds. Avoid using insecticides when possible to encourage lady beetle population growth.

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Vegetable Guide for Utah is Now Available!



See the new guide for more information on these related topics:

- Row Covers (pg 6).
- Nutrient Management (pg 14).
- Curly Top Disease (pg 41).
- Blossom-end Rot in eggplant, pepper, and tomato (pg 46).
- Earwigs in Sweet Corn (pg 96).
- Spider Mites in Sweet Corn (pg 103).

The guide is now available as a free downloadable pdf on the USU Extension Utah Pests website (<http://utahpests.usu.edu/ipm/html/vegetables>). We encourage home gardeners to take advantage of the free online copy, as only a limited number of bound copies are available.

Bound copies are available to vegetable growers, industry support sectors (suppliers, processors), and extension and agency crop and pest management staff. Contact guide editor, Bonnie Bunn, USU Extension Vegetable IPM Associate (bonnie.bunn@usu.edu) to order bound copies.

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