Sunburn/Sunscald, Squash Diseases, and Spider Mites

August 31, 2017



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Sunburn/Sunscald in Vegetables

If you have seen sunburn damage on your peppers, tomatoes, and eggplant this year, perhaps it is time to consider management options for this year's harvest and next year's crop.





Sunburn damage can also occur in other vegetable crops including melon, squash, cucumber, bean, pea, and sweet corn. See the table below from the USU Fact Sheet on Using Shade for Fruit and Vegetable Production.

TYPICAL FRUIT SURFACE TEMPERATURE (FST) AT WHICH SUNBURN DAMAGE OCCURS AND DESCRIPTION OF DAMAGE.

CROP	FST	Damage Description
SOLANACEOUS	(°F) 100-113	Begins as yellow/brown discoloration on sun-exposed side of fruit. Discolored
(TOMATO/PEPPER/ EGGPLANT)		flesh becomes tough. As damage continues, flesh becomes thin, leathery, dry, and white and may allow rot organisms to enter the fruit (Fig. 2).
CUCURBITS (MELON, SQUASH, CUCUMBER)	100-104	Yellowing of the skin exposed to the sun, becomes white with continued exposure. Secondary fungal infection is common where sunburn is severe.
LEGUMES	>90	Starts as small water-soaked spots that turn reddish-brown and can grow together
(BEAN, PEA)	drop	growth on the sun-exposed side, causing pods to curve or grow in a C shape.
SWEET CORN	95-120	Growth slows and fertilization is significantly reduced when silk temperatures exceed 95°F. Silks can dry out or be damaged leading to zippering (undeveloped kernels, Fig. 5) from poor pollination (110-120°F).
APPLES	113-125	Sunburn necrosis appears as a sunken dark brown patch on the side-exposed to the sun, browning or bleaching occurs at lower temperatures.
STRAWBERRY	105-120	Fruits soften and turn a murky pink color on the sun-exposed side.
RASPBERRY/ BLACKBERRY	105-110	Berries are an aggregate of drupelets. Individual drupelets on the sun-exposed side turn white and eventually shrivel (Fig. 2).

*FST=Fruit Surface Temperature; direct sunlight causes FST to exceed air temperature by 25-30°F.

Management:

For Harvest:

- Use proper harvest techniques avoid cutting or breaking off leaves and vines during harvest
 - $\circ\,$ Bell peppers, tomato, summer squash, and cucumbers are particularly prone to sunburn when harvesters break open the plant canopy
- Shade harvested fruit to reduce the risk of post-harvest sunburn

For Next Year's Crop:

- Choose sunburn-resistant cultivars that produce more foliage or that have a fruit color that reflects more sunlight
- Keep plants healthy good leaf cover will naturally shade fruit
- Provide adequate water, fertilizer, and monitor plants closely for insects and diseases that can cause defoliation or leaf curling
- Provide trellising for crops with heavy fruit load (e.g. tomato, pepper) to support branches so they do not open when fruit becomes full-sized
- Construct shade cloth over the crop during the growing season timing varies by crop
 - $\circ~$ Bell peppers and tomatoes are most susceptible to sunburn at the mature-green stage but are more resistant when they turn red
 - $\circ\,$ Cucumber and summer squash should be shaded once flowering begins
 - $\circ~$ Store shade cloth under cover during the winter to extend its life

For more information on shade cloth options, percent shade, orientation, and cost see the USU Extension Fact Sheet on Using Shade for Fruit and Vegetable Production

Squash Diseases

Powdery mildew and squash bugs aren't the only squash issues we have seen this season. Watermelon mosaic virus, Alternaria leaf blight, and verticillium wilt have also been observed.

WATERMELON MOSAIC VIRUS (WMV)

WMV is a potyvirus that affects summer and winter squash, zucchini, gourds, and pumpkins. The virus is spread by aphids which acquire the virus from infected weeds or alfalfa. WMV overwinters in infected perennial weeds or alfalfa.

Symptoms

Symptoms usually begin to show in June. First symptoms are often seen on field edges and aphids continue to move the virus across the cucurbit field.

- Mosaic patterns on leaves
- Distorted leaves
- Color breaking on fruit
- Warts on Fruit



Squash plant infected with a potyvirus



Squash fruit showing color breaking on fruit due to potyvirus infection



Squash leaf exhibiting mosaic patterns cause by a potyvirus



Aphids, which vecotr potyviruses, found on infected squash plant



Aphid skins left behind on squash leaf infected with a potyvirus



Winged and wingless aphids found on squash leaf infected with a potyvirus

Management options are very limited, and include;

- weed control,
- crop rotation,
- and keeping cucurbit fields away from alfalfa fields when possible.

There are resistant summer squash and zucchini varieties, but there are no resistant winter squash or pumpkin varieties. Insecticides for aphids are of limited value to control the disease.

For information on common vegetable aphids in Utah see our new fact sheet: Aphid Pests on Vegetables

ALTERNARIA LEAF BLIGHT

Alternaria leaf blight is caused by the fungus *Alernaria cucumerina* and is most problematic on melon but can also occur on cucumber, pumpkin, and squash. This fungus is spread long distance on wind currents and in the field by splashing water. It overwinters primarily in infected plant debris.

Symptoms

- Lesions on leaves
- First lesions appear on older leaves, near the crown
- Lesions initially yellow brown and small with a light green or yellow halo
- Lesions expand into large, brown necrotic areas, which usually show concentric zonation when viewed from above
- Lesions coalesce as they enlarge
- Leaves develop a cupped appearance and then die, exposing fruit to sunburn, which reduces quality and quantity of marketable fruit



Alternaria leaf blight (Alternaria cucumerina) on cantaloupe – Jason Brock, University of Georgia, Bugwood.org



Alternaria leaf blight (Alternaria cucumerina) on cantaloupe - Jason Brock, University of Georgia, Bugwood.org

Management

- Rotate vegetables so at least 3 years go by before planting any member of the squash family in the same location.
- Use drip irrigation instead of overhead sprinklers if possible.
- Do not work in plants when wet.
- Remove and destroy infected plants at the end of the season in small gardens
- Deep plow crop residue at the end of the season in large fields.
- Preventative fungicide sprays are effective but are only necessary in fields with a history of Alternaria Leaf Blight.
 - **Reduced risk commercial options:** penthiopyrad (Fontelis), mancozeb (Gavel^o), *Streptomyces lydicus* (Actinovate AG^{OB})
 - Commercial options: difenoconazole (Aprovia Top), chlorothalonil (Bravo, Echo, Equus, Initiate), pyraclostrobin (Cabrio EG), mancozeb (Dithane, Manzate, Penncozeb), cyprodinil (Inspire Super), tebuconazole (Luna Experience), Fluopyram (Luna Sensation), pyraclostrobin (Merivon), boscalid (Pristine), azoxystrobin (Quadris Opti), azoxystrobin (Satori), fludioxonil (Switch), famoxadone (Tanos), zoxamide (Zing)
 - Home options: Bonide Fung-onil
 - $\circ\,$ For more fungicide options see the Pacific Northwest Pest Management Handbooks
- ^o= Organic, ^B= Biopesticide

VERTICILLIUM WILT

Verticillium wilt is caused by the fungus *Verticillium dahliae* which affects several vegetable hosts including tomato, eggplant, pepper, okra, potato, artichoke, cucurbits (melons, squash, cucumber, etc.), spinach, and lettuce. *V. dahliae* is a soilborne fungus that infects host crop roots and invades their water-conducting tissues. It can survive in the soil for many years. This season, it has been found in squash, watermelon, eggplant, and okra.

Symptoms

- Initial symptoms include loss in luster in part or all of the crown leaves
- Stressed leaves (from heat and/or fruit set) develop wilted and chlorotic v-shape areas at the leaf edge
- Leaves turn completely yellow and dry up
- Wilting progresses up the plant until the plant dies
- Discolored vascular tissue may be revealed in a cross-section of a node near the plant base



Verticillium wilt on squash - R.S. Byther



Verticillium wilt on pumpkin leaves - D.A. Inglis

Management

Prevention is important as the fungus is very difficult to eradicate once it has been introduced into a field and can survive in soils without a host. Once the fungus is present, management practices should focus on reducing the amount of initial inoculum since curative measures do not exist.

Squash recommendations:

- Delay planting until temperatures are warm.
- Avoid planting in fields known to have a Verticillium wilt problem.
- Avoid planting in former potato, tomato, or mint fields.
- Remove diseased plants and post-harvest debris to reduce fungal buildup.

General recommendations:

- Maintain adequate, but not excessive, moisture and nitrogen levels in the soil.
- Resistant or partially resistant cultivars of some susceptible plant species are available.
- Soil fumigation with metam sodium can reduce the impact of Verticillium Wilt.

Other causes of wilting in squash plants:

- Squash bug feeding damage
- Bacterial Wilt
- Cold temperature
- Phytophthora blight

For more information on Verticillium Wilt see the following links:

Verticillium Wilt in the Pacific Northwest

Disease Information for Specific Hosts Including Watermelon, Eggplant, Okra, Potato, Tomato, and Others

Spider Mites



Tiny white spots are spider mites that have caused damage to this bean pod



Stippled bean leaves from spider mite damage



Tiny black specks are spider mites on this bean leaf



Dying bean plant due to spider mite infestation

The hot, dry, and dusty conditions of this season have caused localized outbreaks of spider mites in various vegetable crops. Spider mite outbreaks can also occur after insecticide sprays have been applied that kill their natural predators.

Without a hand lens or microscope, spider mites look like tiny moving specks of dirt or light colored spots. They cause damage to host plants by sucking cell contents from leaves. A small number of mites isn't reason for concern, but very high populations can damage plants.

Spider mite hosts include bean, pea, tomato, cucurbits (cucumber, squash, melons) beet, carrot, corn, eggplant, parsley, pea, pepper, and sweet potato.

Symptoms

- Stippled or flecked leaves
- Discoloration (gray or bronze) and scorching of leaves
- Leaf loss (which can significantly impact yield and lead to sunburning of squash, melons, and watermelons)
- Potential plant death

Management

- Keep plants healthy and unstressed especially by drought.
- Avoid using malathion, pyrethroid, and broad-spectrum insecticides and miticides for other pests.
- Use a strong stream of water from a hose-end nozzle, directed to the undersides of leaves and lower portions of plants, to physically wash mites off of infested plants.
- Use a slow-release nitrogen fertilizer when possible as high nitrogen levels in foliage encourage spider mite reproduction.

For more information see Pests in Gardens and Landscapes: Spider Mites.

Sap Beetles



Adult sap beetles on an ear of corn – Eugene E. Nelson, Bugwood.org

Sap beetles have been observed infesting corn this season. They are typically secondary pests of corn but can act as primary pests if populations are high. Damage from other pests, such as the corn earworm, can provide entry sites for sap beetles. Sap beetles may also infest tomatoes, raspberries, strawberries, and muskmelons, especially if these fruits are wounded or overripe.

Damage

In corn, adult sap beetles feed on corn silk, pollen, and tassels. The larvae attack and feed on intact kernels and may hollow out kernels of the upper half of the ear. Super sweet corn varieties are particularly susceptible to sap beetle damage because of the poor tip coverage by corn husks and the higher concentration of sugar in the developing kernels.

Management

- Prevent damage from other primary pests such as corn earworm and European earwig.
- Harvest sweet corn as soon as it is ripe.
- Remove damaged, diseases, or overripe corn.
- Keep surrounding areas clear of plant debris since sap beetle populations will increase in compost or cull piles adjacent to corn fields.
- Locate fields away from favored breeding sites such as vegetable and fruit dumps.
- Sweet corn that matures after surrounding fiddle corn has cropped pollen tend to have lower sap beetle infestation.
- Select resistant varieties with tight, long husks including 'Country Gentleman', 'Golden security', 'Tender Joy', 'Trucker's Favorite', 'Stowell's Evergreen', and 'Victory Golden'.
- Use bait/pheromone traps to monitor and reduce adult sap beetle populations. A trap with both a food base attractant (fermenting fruit juice, bread dough, rotting fruits or vegetables) combined with a lure, containing an aggregation pheromone, will be highly attractive to sap beetles.
- Disk or plow corn fields immediately after harvest to reduce overwintering and breeding sites for sap beetles.

Control with insecticides is difficult because adults and larvae are protected inside the ear and damage occurs close to harvest. If an application is necessary, products with a short pre-harvest interval should be used.

Biological Control/Natural Enemies

There are few natural predators of sap beetles. The tiny parasitic wasp, *Cryptoserphus abruptus*, parasitizes sap beetle larvae. The insidious flower bug, *Orius insidiosus*, feeds on sap beetle eggs.

For more information on sap beetles see the following links:

Utah Vegetable Guide: Sap Beetles Sap Beetles in Home Gardens

Corn Earworm



Corn earworm larvae and feeding damage in corn ears

Corn earworm (CEW) is a common pest of corn whose feeding damage, frass, and often larval body can be seen in infested ears of corn. Corn earworm strongly prefers corn but has other hosts including tomato, artichoke, asparagus, cabbage, cantaloupe, collard, cowpea, cucumber, eggplant, lettuce, lima bean, melon, okra, pea, pepper, potato, pumpkin, snap bean, spinach, squash, sweet potato, and watermelon. Most corn earworm damage in Utah is seen on corn.

Corn earworm overwinters in the soil (primarily in central and southern Utah). There are typically 3 generations/flights per year in northern Utah and 4 or more generations/flights per year in southern Utah.

CEW moths typically lay eggs singly on fresh, green corn silks. Newly hatched larvae crawl down the corn silk and into the ear tip where they chew into developing kernels, but larvae will also chew on silks and leaves.

Symptoms

Corn:

- Direct damage to the ear tip by feeding on kernels
- Damage to silk that can decrease pollination leading to poor earfill
- Contaminates corn ear with a larval body (usually just one but several can occur under high population pressure)
- Produces frass from feeding; this reduces quality, storage life, and appearance
- Increases mold growth within the ear
- Increases sap beetle and earwig infestation by providing an opening in the husk at the ear tip

Tomato and Pepper:

- Tunnel into fruits reducing their quality and marketability
- Chew holes in leaves, stems, and flowers reducing fruit yield and quality

Management

- Plant resistant corn varieties (e.g. 'Country Gentlemen', 'Staygold', 'Golden Security', and 'Silvergent').
- Plant early enough that corn will silk before major moth activity occurs (before 1300 Degree Days with a baseline of 50° F (DD₅₀) or about July 20 Aug 5). What is DD?
- Place clothes pins at the point where the silk enters the ear to keep worms out of ears.
- Till soil in the fall in places where pupae overwinter to decrease their survival.
- Use traps and lures to monitor CEW populations:
 - $\,\circ\,$ Use the net style Heliothis trap and a pheromone lure for baiting CEW monitoring traps.
 - Place the trap by early June along the edge of the corn field; attach the trap to a stake or post so the bottom of the trap is about the same height as the corn silk. Move the trap to different areas of the field to keep it near fresh corn silk.
 - $\circ\,$ Check twice weekly until first catch, then check daily for best results.
 - $\circ~$ Calculate the average number of moths per night, and follow threshold guidelines provided on the next page for deciding when to take treatment action.

Chemical Management

- See the Utah Vegetable Guide: Corn Earworm for more information on chemical control.
- See the Utah Vegetable Guide Corn Spray Tables for more information on commercial and homeowner insecticide options for corn earworm management.

For more information on corn earworm see SARE Corn Earworm.

To learn more about degree days read Using Degree Days to Time Treatments for Insect Pests.

New Aphid Fact Sheet





Our new Aphid Pests on Vegetables fact sheet contains information on the most common aphid species found in Utah vegetables. These include green peach aphid (*Myzus persicae*), potato aphid (*Macrosiphum euphorbiae*), melon (or cotton) aphid (*Aphis gossypii*), and cabbage aphid (*Brevicoryne brassicae*).

Upcoming Events

First Detector Pest Training/Master Gardener Field Day Friday, September 22, 2017

First Detector Pest Training (registration is almost full) | 8:00 AM - 1:00 PM

Master Gardeners have long been a front line of defense in identifying and reporting invasive garden pests. This training will hone your skills on invasive insect identification along with research-based control measures. Our top-notch instructors include scientists from USU Extension, the USDA, the Utah Department of Agriculture and Food (UDAF), and Whitney Cranshaw, Entomologist (Colorado State University) and author of Garden Insects of North America. Seats are limited so register early.

Master Gardener Field Day | 2:00 - 4:30 PM

Stroll through the beautiful demonstration gardens and learn from our specialists about the latest and greatest landscape and garden-related topics. A few lucky gardeners will walk away with a set of Sego Supreme (water-wise) plants that have been bred and introduced by the Utah State University Botanical Center or maybe even a bit of freshly harvested honey...

MORE INFORMATION & EVENT REGISTRATION