

## Insect/Disease Information

### VEGETABLES

#### Cabbage Caterpillars



Damage from cabbage larvae (cabbage looper, imported cabbageworm, and diamondback moth) is occurring in many areas of northern Utah on most crucifers (cabbage, kohlrabi, broccoli, Brussels sprouts, etc.) Damage and feeding will continue until frost.

The caterpillar of the imported cabbageworm (a butterfly) is green and velvety, and sluggish in movement. They may occur on the upper or lower leaf surface. There are 3-4 generations per year.

Diamondback moth caterpillars are small, light green, highly segmented, and pointy in shape. When disturbed, they wiggle vigorously and may drop off the plant on a string of silk. Most often, they come to the northern Utah region by migrating from southern locations or on strong winds. Adults can be monitored with a pheromone trap.

Cabbage looper also can be blown from the warmer part of the state, although some pupae do survive in northern Utah. The caterpillar is shiny, light green, with wavy white or light yellow lines down the back and sides. They move more quickly than the cabbageworm in a characteristic "inchworm" motion. Adults can be monitored with a pheromone trap.

To determine how much damage you may have, scout plantings weekly by checking at least 10% of the field in random locations. Look on the undersides of leaves for eggs and larvae, especially on the innermost leaves. Treat when 10% of the plants have caterpillars. Once they get inside a cabbage head, or in broccoli flowers or sprouts, they are difficult to treat.

#### **Treatment:**

*commercial* growers: Bt (on young larvae, Xentari, Agree), indoxycarb (Avaunt), spinosad (Entrust, Success), spinetoram (Radiant), pyrethrin (Pyganic), tebufenozide (Confirm 2F), methoxyfenozide (Intrepid)

*residential* growers: neem oil, spinosad (Bonide, FertiLome, Monterey), pyrethrin (Ace Flower and Vegetable Insect Spray), carbaryl (Sevin, Bayer Advanced), acetamiprid (Ortho Fruit and Vegetable Insect Killer)

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### Potato Verticillium Wilt



Sometimes called early dying, verticillium wilt of potatoes is a minor disease that can occur where potatoes are not rotated out. It is caused by a soil borne fungus that survives in the soil on debris and old rootlets for many years. Tomatoes are also susceptible.

Infected plants will start showing symptoms at this time of year or in the next few weeks. Usually the lowest leaves or one side of the plant will start wilting because the fungus (which clogs the water-conducting vessels), may only occur in a portion of the roots. Leaves turn yellow and then brown on the edges, or entire leaves die. The wilting eventually progresses to the upper leaves or to the entire plant.

You can detect verticillium wilt by cutting the plant off at the soil line and looking at a longitudinal section of the cut end. There will be a light tan discoloration of the vascular tissue that occurs inside the stem, running just below and just above ground level. Infected potato tubers may also show tan or blackened discoloration, occurring in rings, especially near the stem end. Infected tubers are safe to eat.

**Treatment:** The first step is to get a positive diagnosis at the Utah Plant Pest Diagnostic Lab. Other diseases or even drought stress can cause similar symptoms. Infested plants

will need to be removed and the remaining plants should be kept healthy with optimal watering. At the end of the season, remove all plant and root material out of the infested area. The next growing season, rotate the area out of susceptible hosts (potato, tomato, pepper) for at least 3 seasons to resistant hosts such as legumes.

### Powdery Mildew on Melons



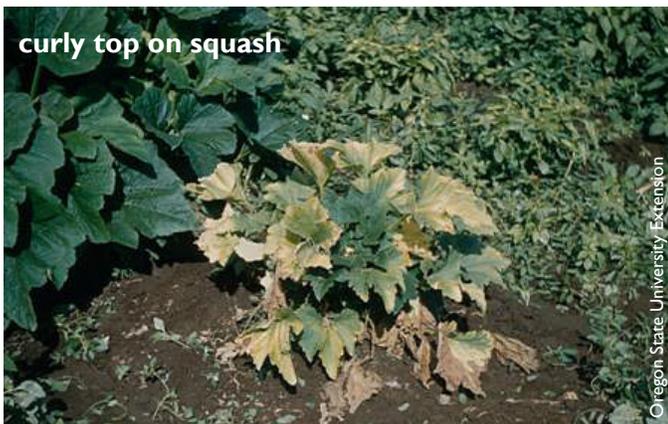
Powdery mildew is just showing up on melons, squash, and other cucurbits. This disease can spread quickly because of its prolific spore production. Surface water is not necessary for spread, and plants can become infected at humidity levels as low as 50%. To stay on top of powdery mildew at your farm or garden, scout for lesions weekly by looking at the oldest leaves of at least 10% of the plants. Powdery mildew of melons infects the bottom of leaves first, and then infections move to the upper leaf surface. To prevent spread, fungicides should be applied when the mildew is first noticed, as most fungicides will not cure existing infections. Heavy infections will minimize yields due to lack of photosynthetic leaf surface.

#### **Treatment:**

*commercial growers:* Sulfur is used as a protectant, and has no systemic activity, so it should be applied with good coverage. If the powdery mildew has already spread throughout much of the crop, use a systemic such as Quintec (group 13), Pristine (group 7+11), Flint (group 11), Quadris (group 11), Cabrio (group 11), Rally (group 3), Procure (group 3), or Inspire Super (group 3). (Rotate fungicides among groups to prevent resistance.) Spray every 7-10 D.  
*residential growers:* sulfur

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### Beet Leafhopper and Curly Top Virus



The beet leafhopper carries the virus, curly top, which can affect many vegetables, including beets, beans, tomatoes, spinach, and melons. The leafhopper is an important pest only due to the fact that it vectors the virus; feeding alone does not cause severe damage. Beet leafhopper overwinters as a mated female in weed hosts in southern Utah, and migrates or is blown to other parts of the state in early summer.

Curly top can be a devastating disease, because it survives in a wide range of weed hosts, is easily spread, and difficult to manage. The leafhopper picks up the virus while feeding on infected weeds in spring. When weeds dry down, the leafhopper migrates to irrigated gardens and rangeland. A leafhopper can spread the virus from one plant to the next in 4 hours. A leafhopper can vector the virus for the duration of its life, but it does not pass on the virus to its progeny.

Symptoms vary according to the host plant, but in general, newly infected plants show inward or downward rolling of margins on the youngest leaves that is often associated with chlorosis, and plant drooping. Later, leaf curling and distortion increases, veins swell, and wart-like bumps appear on the undersides of leaves. Leaves are dark, thick, and brittle. The plant is stunted and eventually may die.

This disease is most often seen on tomatoes in Utah. Infected tomatoes will have chlorotic leaves with purple veins, and the plant will appear silvery in color. The leaves thicken and become leathery and brittle, and the blossoms may drop, preventing fruit set. Fruits that are already formed turn yellowish red, and ripen prematurely to a poor quality, stunted fruit.

Distribution of the disease from season to season varies, and depends on when leafhoppers leave overwintering sites in spring, percentage of leafhoppers carrying the virus, size and condition of susceptible plants at the time of infection, and weather conditions.

#### Treatment options:

- *Insecticides against beet leafhopper are not an option* because of the wide movement of the insect and the difficulty in determining when the leafhoppers are present.
- Growers in areas that face continual virus infections should *plant varieties labeled as resistant*. Trials in southern Utah showed that the resistant labeled varieties Rowpac, Roza, Salad Master, and Colombian, fared well.
- *Plant at a higher than normal density* to lower the probability that every plant will be infected, allowing some plants to survive without decimating the entire field.
- Using *remay* (a white mesh fabric) over plants will prevent beet leafhopper feeding.

### Thrips on Peas, Tomato, Onion

Thrips are microscopic insects with a long, narrow body and fringed wings. Young nymphs are yellowish in color and do not have wings. They feed by scraping cells and sucking out the contents, causing the foliar tissue to turn white. As they feed, they leave behind tiny black droplets of excrement,

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characteristic of this insect. Heavy feeding leaves a silvery cast to the leaves. Plants can usually tolerate moderate feeding.

Onion thrips are the most destructive pest of onions in Utah, not only for their heavy feeding, but because they vector the iris yellow spot virus. They thrive in hot, arid conditions. Feeding symptoms include whitish streaking of the foliage, plant wilting, and during July and August (when bulbs are rapidly enlarging), reduced bulb size due to loss of plant vigor.



thrips feeding damage on peas



feeding damage on tomato



thrips colony on onion, near neck

Now is the time to scout fields/plants. On onions, look on the newest leaves near the center of the onion neck, and count bodies. In mid to late summer, treat when more than 30 thrips/plant are found.

To manage thrips, consider using a variety of options because they can quickly develop insecticide resistance. Heavy sprays of water (including overhead irrigation) will dislodge and drown the thrips. Also, applying straw mulch, and interplanting with carrots as an alternate host, can reduce thrips populations on onion and other plants.

### Treatment

*commercial:* azadirachtin (Azatin, Neemix), spinosad (Success, Entrust), spinetoram (Radiant), insecticidal soap, kaolin clay (Surround), carbaryl (Sevin), methomyl (Lannate), permethrin (Ambush, Pounce)

*residential:* spinosad (Green Light), insecticidal soap, kaolin clay, Sevin

### Corn Earworm



It is time to start thinking about corn earworm, especially if you have sweet corn that is beginning to tassel up AND you had problems in past years.

The corn earworm is a moth that is not able to survive winters in northern Utah. Most moths are blown up from southern regions during the summer so that by the time corn has started to silk in the northern region, moths are ready for egg-laying. If your corn was planted early and formed silks in June, you have probably avoided injury by corn earworm.

Adults lay eggs on the silk, so corn treatment should begin at the tasseling stage, 2-3 days before silking. Eggs will continue to be laid on silks until they turn brown. Feeding on the silks reduces pollination, and feeding on the kernels results in unmarketable corn.

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To know for sure whether or not you need to treat (or when to start), you can monitor for the presence of corn earworm with pheromone traps called heliothis traps. Traps are made of fabric and tied to poles above the corn. A lure attracts moths to the trap. If the trap is not catching moths, you will not need to treat. Once the trap starts catching 10 moths/night (and silks are present), it is time to start treating.

Another, more intensive monitoring method is to check for direct damage. Look at corn kernels for larval feeding by pulling back the sheath and looking for frass (excrement) at the tips of the ears, or examine silks for feeding.

**Treatment:** Start 2-3 days before silking, and repeat applications based on insecticide residual until silks turn brown.

*commercial growers:* permethrin (Pounce, Ambush), esfenvalerate (Asana), bifenthrin (Capture, Brigade), carbaryl (Sevin), spinosad (Success, Entrust)

*residential growers:* permethrin (Bayer Advanced Dust, Hi Yield), spinosad (Green Light, Monterey), or carbaryl (Sevin)

Alternative option: Spray silk (or use eyedropper) with petroleum oil (or corn or soybean oil) with or without Bt (*Bacillus thuringiensis*) at a rate of 1 part Bt to 20 parts oil. Apply mixture 2-4 days after silk is fully grown and pollination is almost complete (when the silk tips have begun to wilt and turn brown). Oil applied earlier will interfere with pollination, and oil applied later may result in more feeding damage. Only one application is necessary.

### European Earwig

Earwigs are becoming quite a problem for Utah vegetable growers. The vegetable garden/farm, because it is a moist environment often surrounded by drier conditions, has lots of succulent plant tissue to feed on and many places for these insects to hide. We are entering the period where their populations are starting to peak, with a decline toward mid September.

One thing to keep in mind is that earwigs are omnivorous, and important predators of many other soft-bodied insect pests.

#### Treatment:

- Do not over water, or plant too tightly
- Remove earwig hiding spots in the garden, such as old debris, mulch, and weeds, and cultivate the soil.
- Trap earwigs:
  - Lay traps of rolled cardboard on the ground at the base of plants. Clean out or replace traps daily (each morning). If reusing, dump earwigs in a bowl

earwigs exposed in unrolled corrugated cardboard trap



of soapy water. Rolled damp newspaper or sections of hose also work. Adding wheat bran inside the trap improves effectiveness.

- Place small tuna or cat food cans filled with oil (fish oil or bacon grease+vegetable oil) just below the soil line near plants; replace regularly
- Insecticides: carbaryl, spinosad, Sluggo Plus Bait (iron phosphate plus spinosad)

### Squash Bug

squash bug nymphs hatching



heavy squash bug feeding results in wilted plants



Adult squash bugs have been actively feeding on squash stems, mating, and laying eggs. We have detected eggs on the under-

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**Diligent monitoring is important in managing squash bugs. After you find eggs, use duct tape to pull them off.**



sides of leaves and they will be hatching soon (if not already in your area). Egg-laying will continue through mid-August.

It is very important to monitor for eggs (look on the undersides of leaves at V's of leaf veins) because when they hatch, the nymphs are very easy to treat (or, remove the eggs altogether). Nymphs will often feed in clusters on the undersides of leaves and sometimes on the developing fruit. As they get older, they disperse and are more difficult to treat. They feed by sucking plant juices, causing yellow speckling and browning.

In areas of heavy feeding, wilting and death of leaves or plants can occur. This is sometimes referred to as "sudden wilt." Adult squash bugs feed on the vines and stems, puncturing the xylem cells, and preventing water transport up to the leaves. Wilting can occur on individual leaves, a section of a plant, or an entire plant.

**Treatment:** 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, lambda-cyhalothrin (Warrior)

*residential growers:* acetamiprid (Ortho Fruit & Vegetable), neem oil (Concern, Ferti-Lome), permethrin (Hi Yield), kaolin clay (Surround), carbaryl

### Grasshoppers

Grasshoppers have voracious appetites and feed on just about everything, from grasses to ornamental plants to vegetables and fruits. Feeding injury on vegetable plants appears as random, ragged holes in leaves. This type of feeding will not cause a reduction in yield, but grasshoppers have been known to cause severe damage in high numbers. They are most common where vegetable fields border rangeland, pasture, roadsides, fence rows, etc.

They overwinter as eggs, which are laid in undisturbed soil in September and October. Eggs hatch in mid to late spring, and

the young grasshoppers pass through several stages, gradually maturing to an adult by early August in northern Utah. Their population sizes vary from year to year depending on a variety of factors (weather, diseases, vegetation, etc.). The severe cold conditions in January killed many eggs, although many more have survived.

Control of grasshoppers is most effective when they are 1/2 to 3/4 inch long. One of the best options is to use a bait product with a grasshopper pathogen while the grasshoppers are young. NoLo is available at most garden center/farm stores, and contains the protozoan, *Nosema locustae*, in a bran shell. It kills only grasshoppers and crickets, but is slow-acting (4-6 weeks), and must be ingested. It works best when applied to hatching areas of sparse vegetation.

Another bran bait that appears to only be available online (Planet Natural) is EcoBran, containing carbaryl. Like the NoLo bait, it should be used when grasshoppers are small, and spread evenly throughout the infested site. Grasshoppers will consume the bait as they forage. Re-apply both types of bait following rainfall or irrigation.

#### **Treatment:**

carbaryl+bait (EcoBran), NoLo Bait, carbaryl (Sevin, many others), permethrin (Gordons, Hi Yield), bifenthrin (Tundra, Allectus, Brigade, Sniper, Talstar)

### Spider Mites

Spider mites are building in numbers in a variety of crops, including melons, raspberry, eggplant, beans, and more. If they can be treated when the 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. Or, use a 20x hand lens.

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. 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.

Keep in mind that 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 toward this pest. Manage dust build-up on leaves, water plants down regularly.

#### **Treatment**

*commercial:* Kelthane, Aldicarb, Acramite, Apollo, Biomite  
*residential:* neem oil, horticultural oil, insecticidal soap, sulfur (do not use oil, soap, or sulfur at temps over 85°F)

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### BERRY CROPS

#### Raspberry crown borer



If you are noticing entire canes wilting in your raspberry field, it is possibly damage from the raspberry crown borer. Larvae are actively feeding in the roots and crowns, and entire canes can be killed in response to the feeding. Often, the canes can be easily pulled out of the ground. You may see some tunneling in the lower part of the cane.

The crown borer is a clearwing moth, and the larvae live and bore into the crown and roots of blackberries, raspberries, loganberries, and wild brambles. The problem with this pest is that low levels of infestation can suddenly develop into a severe problem, so it is important to keep an eye on the health of your plants during the entire season.

The crown borer larvae actually spend two years feeding and developing in the plant, and the damage is most evident during the second year of larval activity. Early in their life cycle, they are feeding on the smaller roots, and as they get larger, they move to the crown. Pupation occurs in the crown in mid to late August.

Early fall is the best time for treatment because larvae will leave the crowns and move to the roots for the winter. At least two years of diligent treatment is necessary in an infested field.

**Treatment:** drench roots with bifenthrin in early fall

**Precautionary Statement:** Utah State University Extension and its employees are not responsible for the use, misuse, or damage caused by application or misapplication of products or information mentioned in this document. All pesticides are labeled with ingredients, instructions, and risks. The pesticide applicator is legally responsible for proper use. USU makes no endorsement of the products listed herein.

#### Raspberry Horntail



Continue to cut off the tops of wilted canes and kill the larva inside. Sometimes, the cane is "hollow" where the larva is inside, and you can squish the cane to kill the larva.

By keeping up with keeping the plants free of horntail larvae, you are reducing the population for future infestations.

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