

## Production

### Success in Sowing Carrots



Carrot seedlings.

One of the bigger issues with getting carrots germinated is that since we plant them so shallow (nearly on the soil surface) the ground often dries out rapidly and thus the seeds refuse to germinate.

Here is an approach that I have used with pretty good success:

1. Prepare the seed bed as normal, raking it smooth and level.
2. Scatter carrot seeds on soil surface. I generally plant on 2-3 foot wide beds rather than rows but you could do rows.
3. Water the soil well. This hydrates the soil and helps settle the seeds into the soil
4. Cover the seed with a sheet of plywood. Since my beds are about 3 foot wide, I have an old sheet of 3/4 inch plywood 3 foot wide by about 4 foot long.
5. In the spring (when cool) leave the ply exposed so the sun heats it up. In the summer, cover the ply with grass clippings or straw so it stays cooler.
6. The ply keeps the moisture from evaporating off the soil so don't peek under it. If you do look, give it a

bit of water. Generally, in spring, 14-20 days later, you will see the carrot seedlings starting to sprout. In the summer, this may take 7-10 days (since it is warmer). Be sure you know the difference between carrot plants and weed seedlings.

7. Once the seedlings are germinated and growing, prop-up the ply with some bricks, stones, etc. so that the ply is off the young plants but leave the board in place so the tender seedlings are not scorched by the sun (board provides shade). About 1 week later, the board can be put away until the next planting.
8. Generally, the last planting date will be sometime in July so the crop can mature in October.

-Dr. Dan Drost

## Diseases/Insects

### Curly Top Virus of Tomato

#### Description:

Curly top of tomato is a common disease in Utah and the western U.S. It is caused by Beet Curly Top Virus (BCTV) and is vectored and spread by the beet leafhopper (BLH) insect. Many host plants may be affected by this disease. Tomatoes are not the desired hosts of BLH, but they will feed on tomato plants when other hosts become dry in the summer heat. Peppers may also become infected with BCTV.



Beet leafhopper, vector of beet curly top virus.

### Symptoms:

Tomato and pepper plants infected with curly top are stunted in growth and show yellow, upward curling leaves. Veins on the underside of tomato leaves are purple. 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.



A tomato plant infected with curly top virus shows symptoms of yellow, upward curling leaves, and stunted growth.

### Management:

Management of curly top disease is challenging because there are no resistant varieties, and once infected with the virus, host plants cannot be treated and should be removed.

Although it may be too late for infected plants this year, here are some management methods that will help in the future:

- Use plastic row covers for the first 6-8 weeks (when BLH are active) to exclude leafhoppers. This may not reduce all occurrences of curly top virus but can significantly reduce the chances of infection.



Tomatoes covered in plastic row cover for the first 6-8 weeks are less likely to be infected with curly top virus.

- Delay planting by one or two weeks. Planting after leafhoppers have migrated through an area can reduce disease incidence significantly, depending on the area.
- Manage weeds. Weeds can be treated with insecticides against beet leafhoppers but it will be ineffective to treat tomatoes as it only takes one leafhopper to infect a plant. Treat weeds early in the season before BLH move to tomato hosts.
- Use dense plant spacing when possible. This makes it more difficult for BLH to find host plants.
- Use intercropping or trap crops that will be more attractive to BLH around tomatoes and peppers.

For more information on BLH and BCTV, see pgs. 145-146, 150-151, 159-161, 164 of the 2016 Vegetable Production and Pest Management Guide:

<http://utahpests.usu.edu/IPM/files/uploads/Publications/UT-veg-guide-2016.pdf>

For more information on Curly Top Virus, search the internet for (or click the following link):

[Utah Pests Curly Top of Tomatoes](#)



Potato psyllid adults and nymphs on a potato leaf at the end of the growing season in Utah.

## Potato Psyllids

### Psyllid Damage:

Potato psyllids are generally detected in early July, however, they may colonize a potato field around mid-June. About four weeks ago (June 17) in Utah, we spotted one psyllid nymph on a potato leaf. All stages of psyllids feed on potato foliage with needle-like mouthparts that suck out plant juices. Toxins from their saliva are injected into the plant as they feed. This causes "psyllid yellows" which turns leaves yellow or purple. Psyllid yellows also causes fewer, smaller, or misshapen tubers.



Potato psyllids can cause "psyllid yellows" that turn potato leaves yellow or purple.

### Zebra Chip Disease:

Adult psyllids also vector the bacterium, *Candidatus Liberibacter solanacearum*, which causes Zebra chip disease (ZC) in potatoes. Symptoms of ZC are below-ground on potato tubers and are only visible when tubers are cut. The vascular tissue in the tuber has a brown discoloration which becomes even more pronounced when the potatoes are fried. ZC alters the flavor of tubers and can cause significant yield reduction.



Zebra chip disease symptoms on potato foliage (top) and potato tubers (bottom).

### Management:

- Unfortunately, there are currently no effective non-chemical solutions for controlling potato psyllids.
- Monitor for psyllids early in the season to identify population presence and abundance.
- Look for psyllid nymphs on the underside of potato leaves. A hand lens helps to see them.
- Use yellow sticky cards to attract adult psyllids for monitoring.
- If potato psyllids have caused ZC or psyllid yellows in your potatoes in past years, or if nearby fields are experiencing these problems, several insecticide applications may be required to reduce psyllid populations.
- There are no resistant potato varieties for Zebra chip disease and once the potatoes are infected there is no cure.

### Treatment options:

Currently, no action threshold exists for potato psyllids on potato. It is suggested that undersides of leaves be examined for nymphal stages. The undersides of bean and pepper leaves may also show potato psyllid nymphs. If potato psyllids are detected (any life stage), consider treating with an insecticide.

**(commercial products)** beta-cyfluthrin (Baythroid XL<sup>R</sup>), cyfluthrin (Tombstone<sup>R</sup>, Tombstone Helios<sup>R</sup>), esfenvalerate (Asana<sup>R</sup>), imidacloprid (Macho, Nuprid2SC), extract of *Chenopodium abrosioides* near *ambrosioides* (Requiem<sup>B</sup>), azadirachtin (Aza-Direct<sup>OB</sup>), *Beauveria bassiana* (Botanigard<sup>B</sup>)

**(homeowner products)** cyfluthrin (Bayer Vegetable and Garden Insect Spray), deltamethrin (Green Light Many Purpose Dust), pyrethrins (Monterey Bug Buster-O<sup>OB</sup>), pyrethrins + canola oil (Earth-tone Insect Control<sup>B</sup>), acetamiprid (Ortho Flower Fruit & Vegetable), oils (Bayer Natria Multi-insectB), insecticidal soap (Bayer Natria<sup>B</sup>)

**For more information on Potato Psyllids and ZC see pgs. 123-124, 128, 130-132, and 134 of the 2016 Vegetable Production and Pest Management Guide:**

<http://utahpests.usu.edu/IPM/files/uploads/Publications/UT-veg-guide-2016.pdf>

**For more information on Potato Psyllids, search the internet for (or click the following links):**

[UC Davis Potato Psyllid](#)

[Oregon State Potato Psyllid Vector of Zebra Chip](#)

[UC Riverside Potato Psyllid](#)

[University of Minnesota Management of Potato Psyllids](#)

# Insects

## Earwigs

It's the time of year when earwigs may be invading your crops. Earwigs are active at night and can injure many parts of vegetable plants including buds, leaves, flowers, and fruits. Feeding damage shows up as tattered holes taken out of leaves and petals as well as round or oblong holes in fruit. Earwigs can also be a nuisance pest when they enter buildings.



Earwigs on a lettuce leaf.

Unfortunately, earwigs are difficult to manage. However, one effective way to attract and kill this pest is to punch holes in the lid and top sides of a plastic yogurt or sour cream container. Bury the bottom of the container in the soil next to problem areas. Fill the container with smelly oils that will attract earwigs like fish oil, clam oil, or bacon grease. Check the traps several times per week, dispose of the earwigs, and refill with fresh bait.



Smelly oils attract and kill earwigs. The trap shown in the bottom image was baited with canola oil and caught 535 earwigs in one night.

**For more information on Earwigs, search the internet for (or click the following link):**

[Utah Pests European Earwig](#)

## Tomato Hornworm

### Description:

Tomato hornworms are very large caterpillars (4 inches long) and have a prominent “horn” on the back end of their body. Hence the name “hornworm”. Hornworm larvae use their chewing mouthparts to feed on the leaves, blossoms, stems, and fruits of tomatoes. Some will also feed on eggplant, pepper, potato, and some species of *Solanum* weeds. Initially larvae feed in the upper part of plants and create dark green or black droppings. As larvae mature, they consume large amounts of plant tissue and can defoliate plants and scar fruits, especially when populations are high. Hornworm damage tends to be more severe in high tunnels than in fields.



A newly hatched tomato hornworm larva on a the underside of a leaf (top), a more developed larva on a tomato plant (bottom).

### Cultural Control:

- Handpick worms from plants.
- Plow field after harvest to decrease overwintering pupae populations in the soil.
- Rotate crops (place non-solanaceous crops after solanaceous crops) to avoid attack the following season from overwintering populations.
- Keep your garden as weed free as possible (especially solanaceous weeds) to discourage egg laying on alternative hosts.



Adult tomato hornworm moth.

### Chemical Control:

Luckily, hornworms are generally easy to control. Hornworm populations often do not exceed economic thresholds due to predation from natural enemies. Treat hornworms only if they are causing extensive defoliation, or if they are feeding on fruit. Target young larvae and eggs as they are easier to kill.

Apply insecticides to the foliage for larval suppression. It may not be necessary to treat an entire field for hornworms as infestations are often localized. A general threshold in the field is one hornworm per two plants. In high tunnels however, there is no established threshold, but treatment is recommended as soon as you see hornworm caterpillars and their damage.

**For control options and more information on Tomato Hornworm see pgs. 147-148, 159-161, and 164 of the 2016 Vegetable Production and Pest Management Guide:**

<http://utahpests.usu.edu/IPM/files/uploads/Publications/UT-veg-guide-2016.pdf>

**For other information on Tomato Hornworm, search the internet for (or click the following links):**

University of Minnesota Tomato Hornworms in Home Gardens

Colorado State The Tomato Hornworm

UC Davis Tomato Hornworms

Michigan State Tomato Hornworm and Tobacco Hornworm

USU Tomato and Tobacco Hornworms

## Diamondback Moth

### Description:

Diamondback pupae are distinguished by their loosely spun cocoons that look like lace attached to host plant leaves or stems. As larvae, they have a pale yellow-green body that is pointed at both ends. Larvae have a habit of wriggling vigorously, or dropping from a plant on a string of silk when disturbed. Eggs are very small and yellow to white in color found singly or in groups of 2-3 on the underside of lower host leaves or stalks. Adult moths are grayish brown with folded wings that flare outward and upward toward the back of their body. Male moths have a row of three yellow diamond-shaped spots down the middle of their back.



A diamondback moth pupa on the underside of a kale leaf; note the lace-like cocoon around the pupa and the "windowpane" feeding damage.

### Damage:

Diamondback moths prefer cabbage and broccoli, but will feed on other cole crops and cruciferous weeds. Right after hatching, larvae mine through leaves (leaving the upper side of the leaf intact) creating small depressions called "window panes" that appear as holes. This damage primarily occurs on outer or older leaves of older plants. Larvae will also feed on flower buds and floral stalks. Larvae may also contaminate the heads and stems of host plants at harvest making them unmarketable or less desirable. Crops can tolerate some feeding damage, however, extensive feeding can distort growth, or prevent head formation of cauliflower, broccoli, and cabbage. A general action threshold is 30% defoliation.



Diamondback moth damage to cabbage; note the ragged holes and stunted cabbage head (right).



Diamondback moth larva on the underside of a kale leaf (top) and a diamondback moth adult (bottom).

#### Management:

- Hand pick and destroy larvae.
- Heavy irrigation or rainfall can reduce early larval populations.
- Promote natural enemies by diversifying plants in the landscape, avoiding the use of broad-spectrum pesticides, and by properly identifying insects in your garden or landscape.
- When chemical treatment is necessary, rotate insecticide groups to prevent the development of insecticide resistance. Worldwide, diamondback moth has developed resistance to multiple insecticides, however, no resistance has been reported in Utah.
- *Bacillus thuringiensis var. kurstaki* (Bt) and spinosad (e.g. Entrust) are organic options that can control small populations of diamondback moth, but may not be effective in major outbreaks.

For more information on Diamondback Moths, see pgs. 36-37, 43-45, and 46 of the 2016 Vegetable Production and Pest Management Guide:

<http://utahpests.usu.edu/IPM/files/uploads/Publications/UT-veg-guide-2016.pdf>

**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.

# Beneficial Insects

## It's Not all Bad

### Soldier Beetle

Soldier beetles are considered beneficial and have been seen in Utah gardens this year. There are numerous species of soldier beetles and many of them are predators as larvae, feeding on small insects, slugs, snails, and worms. As adults, some species of soldier beetles will feed on aphids and other soft-bodied insects. As predators, soldier beetles may help to reduce pest populations like aphids. Adults also serve as pollinators by feeding on pollen and nectar.

### Banded Thrips

Another beneficial insect seen in Utah gardens this year is the banded thrips (*Aeolothrips spp.*). This thrips is very small with a black body and three, thick, white bands across its forewings. The banded thrips is a predator that feeds on other thrips and pests, such as whiteflies and mites. Banded thrips may be observed in areas that have pest mites and thrips.



Soldier beetle (left) and banded thrips (right).

For more information on Soldier Beetles, search the internet for (or click the following links):

[University of Maryland Predatory Beetles](#)  
[University of Illinois Soldier Beetles in the Backyard](#)  
[University of Nebraska Soldier Beetle](#)  
[University of Kentucky Soldier Beetles](#)  
[University of Minnesota Soldier Beetles](#)

For more information on Banded Thrips, search the internet for (or click the following links):

[Utah Pests Advisory Predatory Thrips](#)  
[UC Davis Thrips](#)  
[UC Davis Predatory Thrips \(Natural Enemies\)](#)

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