Extension
UtahStateUniversity

VEGETABLE PEST ADVISORY

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In This Issue

Advisory Key

Current status and risk of pest within Utah. This is based off site surveying, grower reports, and degree-day modeling.

Identifying characteristics of the pest along with their life cycle in Utah.

Identification of signs and symptoms caused by the arthropod pests or disease on host plants.

Monitoring, prevention, and control strategies using integrated pest managment.

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INSECTS

Cutworms

Active early in the season in fields, yards, and high tunnels.

Despite their name, cutworms are caterpillars as opposed to worms. They are the larval stage of moths in the Noctuidae family (owlet moths). Utah is home to many different species. They are early-season pests of vegetable crops, especially in high tunnels. Cutworms have a wide host range including corn, tomato, beans, beet, brassicas, and leafy greens. In Utah, cutworms typically overwinter in the larval stage. Larvae begin feeding early in the season on turf, weeds, and other early plants, and move to plants in gardens and fields. Adult moths are strong fliers and may disperse over a wide area. Eggs are usually laid in large clusters on stems or sometimes structures such as fences or buildings. Life duration is dependent on species and environmental factors.

Cutworm "clipping" young seedling

Barriers used to protect seedlings from cutworm feeding

Cutworms have a wide host range including corn, tomato, beans, beet, brassicas, and leafy greens. Although cutworms get their name for their feeding behavior of cutting the stems of young seedlings, many species also feed on other plant parts. If infestations are high, seedling cutting can drastically reduce yield. In a field setting, this appears as skips or sections of rows where several seedlings are missing.

- Handpick and destroy larvae. Plant early or use early maturing varieties. Mature plants can tolerate feeding damage better than young seedlings.
- Remove plant debris at the end of the growing season, as it may serve as an overwintering site for various growth stages of caterpillar pests.
- Plant tolerant varieties. Mustard, turnip, and kohlrabi are among the more tolerant Brassicas to the diamondback moth. Glossy-green Brassica varieties that lack the normal waxy, grayish-green bloom are somewhat resistant because larvae spend more time searching, and less time feeding, on the glossy leaves.

- Tilling soil in spring or fall can disrupt and destroy overwintering pupae and reduce their population for the following season. Tilling nearby cornfields at the end of the season can decrease the survival of tomato fruitworm pupae.
- Weeds growing amongst the production site can provide food sources for cutworms. Removing cool-season weeds can help starve young caterpillars. Lambsquarters and wild mustards are attractive plants for egg-laying.
- Beneficial insects are a major contributor to natural biological control. Lady beetles (Coccinellidae) and green lacewings (Chrysopidae) prey on eggs. Paper wasps (Vespidae) will feed on many small caterpillars in gardens. General predators such as shield bugs, ambush bugs, and vespid wasps also attack caterpillars, as do many birds. However, since cutworms dwell beneath the soil surface, few of these natural enemies are effective in controlling their populations.

Thrips

Very common in Utah's greenhouses, high tunnels, and production fields.

Thrips are a common pest that can be found on many high tunnel crops, plus hundreds of weed species. They are tiny insects (1.3-1.5 mm long) that feed by scraping and sucking plant fluids from leaves, and often vector plant diseases. Two species commonly found in Utah include Western flower thrips *(Frankliniella occidentalis)* and Onion thrips *(Thrips tabaci)*. Bean thrips *(Caliothrips fasciatus)* may also occur in the state. Thrips species in Utah all have relatively similar life cycles. In mild climates, they overwinter as adults or larvae on both crop debris and weeds. Thrips may have multiple, overlapping generations a year, which is dependent on the temperature. The optimal temperature for thrips development is 86° F. In high tunnels where the temperature is generally warmer, thrips can develop at a faster rate. Adults typically survive 20- 30 days. Females will mate with males or reproduce parthenogenetically (females reproduce without male fertilization). They lay their eggs within young vegetative tissue by cutting slits and depositing them beneath the epidermis. The egg stage lasts 5-15 days.
Once hatched, the thrips will develop through two larval instars where they are often found feeding together in groups on new plant growth. Mature larvae drop to the ground to pupate either on the soil surface, under debris, or inside soil crevices.

Adult thrips

Thrips feeding on pea pod

Both larval and adult stages of thrips cause damage. They feed with "rasping-sucking" mouthparts, where they pierce plant cells and ingest xylem sap and cell contents. This causes irregular white blotches (referred to as stippling, flecking, or silvering) on foliage and flowers. Heavy feeding can cause the plant leaves to curl, twist, or become stunted. Other crop-specific symptoms include:

- Beans: buds and young leaves become distorted with brown edges
- Onion: feeding causes decreased bulb size or plant death
- Cabbage: bronze discoloration of foliage
- Tomato: small indentations develop on young fruits from thrips egg-laying

There are a variety of ways to monitor for thrips, and using a combination of these is best.

- Visually inspect plants for feeding symptoms on foliage and flowers. Use a 10-20x hand lens to then look for thrips.
- Shake foliage or blossoms over a tray or beating sheet and count the thrips present.
- Take a portion of the plant for a destructive test by submerging it into a 2% soap/water solution, shaking it, and counting the number of thrips floating on the surface.
- Sticky traps are effective to monitor the presence of flying adults. Blue traps are sold strictly for thrips, but yellow traps also attract thrips, as well as several other pests, so either can be used. Place traps evenly throughout the high tunnel near susceptible hosts.
- Some non-crop plants can be used as early indicators of thrips presence, and monitoring can be focused on these plants rather than the entire crop. Examples of indicator plants that are highly attractive to thrips include petunia (Calypso, Super Blue Magic, Summer Madness, or Carpet Blue) and fava bean (Aquadulce). These varieties can also display early symptoms of INSV and TSWV, but they do not serve as viral hosts. Place indicator plants in-ground or in pots near the susceptible cash crop (one plant per every 20-30 feet).
- Natural predators of thrips that occur in Utah include banded thrips (*Aeolothrips* spp.), green lacewing larvae, predatory mites, big-eyed bugs, and minute pirate bugs. However, these natural enemies may not commonly occur inside high tunnels

when the tunnel is kept closed or outside temperatures are cool (fall, winter, early spring).

- The predatory mite, *Amblyseius swirskii*, can be purchased from insectaries and released in the high tunnel. Sachets, which are small bags containing mites and a food source, allow for slow but consistent release over several weeks. The bags can be hung above or on plants. Mites can also be purchased in shakers and dispensed where thrip populations are dense.

It is important to choose insecticides carefully, as an application in high tunnels may not be allowed on the product label. In addition, application in enclosed spaces may require additional personal protective equipment. Because thrips reproduce rapidly, in high numbers, and without mixing genes with males (parthenogenetically), they may develop resistance to insecticides that are applied repeatedly. This is especially true of products containing organophosphates, synthetic pyrethroids, and carbamates.

Seed and Root Maggots

Seedcorn maggots feeding on bean seed

Cabbage maggots feeding on kohl rabi roots

Very common in Utah's greenhouses, high tunnels, house plants, etc. Indoor seed starting is also susceptable.

Maggots are the larval stage of various fly species (Order Diptera). There are multiple species found in Utah that can affect our early season vegetable production. Two examples include the cabbage maggot *(Delia radicum)* and the seedcorn maggot *(Delia platura)*.
Adult cabbage maggot flies are dark with grey markings. Males bear three subtle black longitudinal bands on their thorax. The markings on females are much more distinct. Adults range from 5-7 mm. Eggs are laid at the soil level around the stem of cruciferous plants. They're less than 1 mm in size. Females will lay 300-400 eggs during their 1-2-month lifespan. Larva (maggot) develops through three instars. At full maturity, they can reach 8 mm. The mouth hooks are black. Depending on the weather, the larval stage lasts 18-22 days. The pupa is brown, oval, and bluntly rounded on both ends. Adult seedcorn maggot flies are greyish-brown with a few distinctive markings. Males bear stripes on their thorax and a mid-dorsal stripe on the abdomen. These stripes are usually lacking in females. Adults range from 4-5 mm. Eggs are less than 1 mm and are slightly curved. They're laid on the soil surface. When hatched, larvae dig down into the soil looking for suitable hosts. The larva is white and develops through three instars growing to 7 mm at maturity. The pupa is a light reddish-brown.

Cabbage maggots feed on the roots (and sometimes stems or petioles) of cruciferous crops such as broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale, kohl-rabi, mustard, radish, rutabaga, turnip, and watercress. Seedcorn maggots cause damage by feeding on seeds and developing embryos, often before the seedlings break through the soil. Larvae also penetrate seeds as the seed coat splits. This can lead to rotting as they burrow into the cotyledons. Host vegetables include artichoke, beet, Brussels sprouts, cabbage, cantaloupe, carrot, cauliflower, corn, cucumber, garlic, kale, lettuce, lima bean, mustard, onion, pea, potato, pumpkin, rhubarb, spinach, squash, sweet potato, tomato, turnips, and alfalfa.

Monitor for cabbage maggots by using cone-screen traps baited lures that release isothiocyanates (a naturally occurring odor released by crucifers). These traps are often more effective than the traditional yellow sticky trap.
Monitor for seedcorn maggots by cone traps baited with alcohol, odors of fermentation (from honey-yeast or molasses) which are highly attractive to the flies.

- Monitor for adult flies by placing yellow sticky traps near the base of host crops.
- Rotate susceptible crops with unrelated crops.
- Plant seeds into raised soil beds to promote soil drying and warming.
- Destroy or disc under crop residues immediately after harvest.
- Apply row covers for physical exclusion of adult flies.

OTHER ARTHROPODS

Springtails

Adult springtail

Very common in Utah's greenhouses, high tunnels, house plants, and garden beds.

Minute, soil-dwelling (primitive) insects have a bi-forked appendage called a furcula that is folded underneath their body and used, by snapping downward, to propel them through the air when disturbed. Body-color ranges from white to pale brown to red to purple. The eggs are spherical and laid singly or in clusters. Springtails are most common in heavy, organic soils during very wet, cool spring conditions. They overwinter primarily as resting adults below the soil surface.

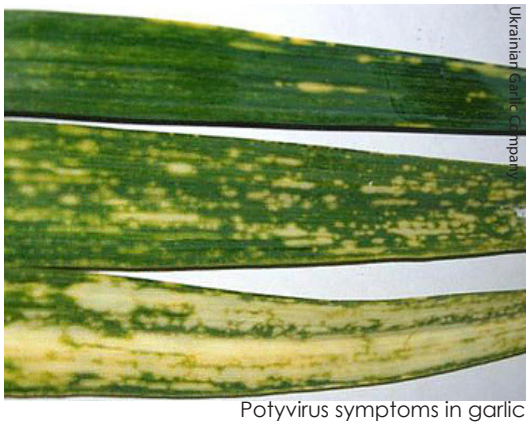

Springtail feeding damage on brassica seedlings

Collembola (springtails) can be a pest of young greens in moist grow boxes and tunnels, especially if there is a high level of organic matter). They cause reduced stands and loss of vigor in surviving plants as they feed on germinating seeds or roots of small plants.

- Reduce moisture and excess organic matter.
- Avoid planting in fields with high levels of organic matter.
- Till soil before and after planting to facilitate soil drying and discourage collembola populations.
- Select greens varieties with a more upright growth habit to reduce contact between the leaves and soil.
- Insecticides are not generally necessary for springtail management but there are home and commercial options available.
- Natural enemies of springtails include rove beetles and predatory mites.
- Sampling (as discussed above) is important in determining management decisions because in most cases, once the damage is noticed, little can be done without replanting.

DISEASES

Viruses in Garlic



Potyvirus symptoms in garlic

Very common in Utah's greenhouses, high tunnels, house plants, etc. Indoor seed starting is also susceptable.

Garlic, onions, and leek (Allium species) are susceptible to a variety of viral diseases, including those in the genus potyvirus. Two potyviruses frequently observed early in the season include the leek yellow stripe virus (LYSV) and the onion yellow dwarf virus (OYDV). LYSV and OYDV are founded in viral complexes together, making their identification impossible without genetic sequencing.

In garlic, potyviruses cause yellow striping on the distal parts of the leaves. This can cause dwarfing of the entire plant and potentially reduce yields. Garlic that is infected with potyviruses is also more susceptible to frost. These potyviruses are vectored by the green peach aphid *(Myzus persicae)* and black bean aphid *(Aphis fabae)*.

In Utah, potyviruses on garlic and other alliums are reported to have minimal to no impact on production. If prevention and management are desired, control should be focused on the aphid vectors. Aphid management resources can be found in past pest advisories and on the Utah integrated pest management website.

Spots on Leafy Greens

Pathogen caused spots on leafy greens are sporadic in Utah, but may be prevelant in in structures with high humidity.

Leaf spots on spinach and chard are caused by the seed-borne pathogens *Stemphylium botryosum* f. sp. *spinacia* and *Cladosporium variabile*. Spores can also spread by wind and rain during cool temperatures (<65°F). Leaf spots on spinach, beet, and chard may also be caused by *Cerospora beticola* which overwinters on infected residue, weeds, and seed. It is primarily spread during high humidity when temperatures are greater than 75°F.

- Tan/olive colored spots, with water-soaked borders (Stemphylium).
- Tan/olive colored spots, distinct borders. Spots eventually merge with visible fungal growth (Cladosporium).
- Distinct spots with dark purple to tan colored borders. Spots eventually merge with visible fungal growth (Cercospora).

Till or remove infected crop residue at the end of the season. Source certified disease-free seed. Rotate to non-host crops (outside of the Chenopodium family) for 2-3 seasons. Use drip irrigation to prevent humidity and moisture on foliage.

Stemphylium leaf spot on spinach

Cladosporium leaf spot on spinach

Integrated Pest Management Tip

In agricultural use, a row cover is a transparent or semitransparent material that is used over crops (typically vegetables) for a variety of purposes. As an IPM tool, row covers act as a physical barrier that prevents the movement of pests such as insects, birds, and mammals, to host plants. This form of management is popular in organic production to avoid chemical application.

Additional References and Resources

- The Backyard Garden: Leafy Greens Pests Fact Sheet (Utah State University)
- High Tunnel Managment: Caterpillars (Utah State University)
- Springtails (Utah State University)
- High Tunnel Management: Thrips (Utah State University)
- Potyvirus Leek Yellow Stripe Virus (Purdue University)