



VEGETABLE PEST ADVISORY

USU Extension, Integrated Pest Management Program, May 25, 2022

In This Issue

- Leafminers
- Imported Cabbageworm
- Cabbage Looper
- Diamondback Moth
- Flea Beetle
- Cold Injury

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 management.

Editor: Nick Volesky
Vegetable IPM Associate
nick.volesky@usu.edu
(435) 797-0319



extension.usu.edu/pests/ipm

INSECTS

Leafminers



First-generation adults have emerged and begun laying eggs. Check your spinach, peas, beets, chard, and collards.



Adults are small (0.06-0.33 inch long), black-gray flies with yellow-green markings depending on the species. Eggs are about 0.04 inches long and 0.0008 in wide, white, elongate, cylindrical, and laid singly or in small groups. The larvae (maggots) are legless, initially colorless but becomes yellowish as it matures with four instars ranging from 0.02-1.0 inch long.



Most mines occur on cotyledons and the first true leaves. It is not necessary to treat leafminers that are feeding on leaves of root crops such as beets, where the edible portion is not affected. However, leafminers on spinach or leafy greens may require management.



- Inspect leaves. Find egg masses throughout the growing season and crush them.
- Clip and remove infested leaves.
- Gently cultivate the soil. Around the plants to uncover pupae and destroy any that are found.
- Use adequate irrigation. This keeps plants healthy.
- Eliminate alternate hosts. Destroy weeds and deep plow or physically remove crop residues which can be food and overwintering sources for leafminers.
- Encourage parasitic wasps. Plant flowering plants with nectar and pollen-rich umbel-type flowers with shallow cups, such as yarrow, dill, and fennel.
- Cultivate the soil in late fall. Expose overwintering pupae to the colder temperatures that will kill them.



Extensive leafminer feeding on spinach leaf



Leafminer larva (maggot)

Insecticide applications help prevent adults from laying eggs, but they do not kill larvae that are already feeding within the plant leaves. Choose low-impact insecticides such as spinosad, when possible to reduce impacts on natural enemies. If insecticides are necessary, the time to treat is on the eggs as they hatch. Make sure to get good coverage on the leaves. Generally, leafminer numbers are strongly suppressed by natural predators, and outbreaks are usually associated with the use of insecticides. Several parasitic wasps and predators, including vespids (yellow jacket and European paper wasp) and predatory thrips, will attack leafminers.

Imported Cabbageworm



The first generation of adult butterflies are out now, they can be seen flying out about near wild mustard hosts or in garden settings where brassica crops have been planted already.



Adults are white butterflies with a wingspan of about 1.75 inches. Males have one pair of black spots on their wings, while females have two pairs. Eggs are laid singly, usually on the outer leaves of the plant. They are bullet-shaped with longitudinal ridges. The larva is green, velvety in appearance, and bears five pairs of prolegs. Larvae develop through five instars before reaching maturity. The Pupa is green in color with yellow stripes on the back and sides; there is no outer cocoon.

Imported cabbageworm overwinter as pupae near host plant debris and emerge as adults in mid-spring. Eggs are laid on the undersides of outer leaves and hatch after 4-8 days. Larvae mature after 2-3 weeks and pupate on the host plant. Pupation takes 1-2 weeks and emerged adults mate and lay eggs for a second generation. One generation takes about 3-6 weeks from egg to adult and 3-5 generations can occur each year.



Imported cabbageworm prefers broccoli, cabbage, and cauliflower, but will feed on all cole crops. Larvae feed on outer leaves, resulting in round holes. Frass (excrement) can stain or discolor broccoli and cauliflower heads. As crop heads develop, imported cabbageworm feed on outside leaves and bore into heads, resulting in unmarketable produce.



- Monitor. Scout weekly for imported cabbageworms by randomly checking one out of ten plants (10%) in small fields, and one out of 100 plants (1%) in fields > 1 acre. Look on the undersides of leaves for small larvae and eggs. Look for feeding holes; search for larvae nearby and inside damaged heads.
- Handpick caterpillars. Where practical (in smaller fields), physically remove larvae when plants are young or when only a few are present.
- Use floating row covers. Apply covers before imported cabbageworms are present to prevent adult moths from laying eggs on plants. Remove covers during flowering to allow for pollination. This option is only practical for home gardens and small commercial fields.
- Sanitation. Clean fields of plant debris after harvest, thus removing overwintering sites for pupae.
- Manage weeds to remove overwintering sites for pupae. Weed hosts for looper caterpillars include wild mustard, peppergrass, and shepherd's purse.

Insecticides containing *Bacillus thuringiensis* var. *kurstaki* (Bt) and spinosad are effective in suppressing cabbage looper larvae. Bt must be applied when larvae are still young (< ½-inch long), and plant coverage is important as Bt must be ingested by larvae to be effective.

When more than one cabbage looper larva is found in one out of ten monitored plants (10%), treat just before heading or at Brussels sprout formation. Seedlings only require treatment if medium- to large-sized caterpillars are present, and defoliation (loss of plant tissue) exceeds 10%.



Imported cabbageworm larvae



Adult imported cabbageworm butterfly

Cabbage Looper



Active Now: Adults emerge in late March to April. Moths immigrate from warmer regions in the south.



Adults are brown-colored moths with a silvery figure eight or 'U' shape with a circle beneath on the front wings. Eggs are yellowish-white to green in color, dome-shaped with longitudinal ridges, and laid singly or in groups of 6 to 7 on the upper or lower surface of leaves. The larva is about 1½ inches long at maturity, with a white stripe along each side of their green body and several narrow lines along the back. Distinguished by their "loop-like" crawling where the midsection of their body forms a loop as they bring their back legs (prolegs) toward their front legs. The pupa is about ¾ inch long. The pupa develops inside a thin white cocoon on the underside of foliage, plant debris, or soil clods



Cabbage looper prefers broccoli, cabbage, and cauliflower, but will feed on all cole crops. Larvae feed on outer leaves, resulting in round holes. Frass (excrement) can stain or discolor broccoli and cauliflower heads. As crop heads develop, cabbage loopers feed on outside leaves and bore into heads, resulting in unmarketable produce.



- **Monitor.** Scout weekly for imported cabbageworms by randomly checking one out of ten plants (10%) in small fields, and one out of 100 plants (1%) in fields > 1 acre. Look on the undersides of leaves for small larvae and eggs. Look for feeding holes; search for larvae nearby and inside damaged heads.
- **Handpick caterpillars.** Where practical (in smaller fields), physically remove larvae when plants are young or when only a few are present.
- **Use floating row covers.** Apply covers before imported cabbageworms are present to prevent adult moths from laying eggs on plants. Remove covers during flowering to allow for pollination. This option is only practical for home gardens and small commercial fields.
- **Sanitation.** Clean fields of plant debris after harvest, thus removing overwintering sites for pupae.
- **Manage weeds** to remove overwintering sites for pupae. Weed hosts for looper caterpillars include wild mustard, peppergrass, and shepherd's purse.

Insecticides containing *Bacillus thuringiensis* var. *kurstaki* (Bt) and spinosad are effective in suppressing cabbage looper larvae. Bt must be applied when larvae are still young (< ½-inch long), and plant coverage is important as Bt must be ingested by larvae to be effective.

When more than one cabbage looper larva is found in one out of ten monitored plants (10%), treat just before heading or at Brussels sprout formation. Seedlings only require treatment if medium- to large-sized caterpillars are present, and defoliation (loss of plant tissue) exceeds 10%.



Cabbage looper



Adult cabbage looper moth

Diamondback Moth



Active Now: Adults overwinter in the warmer southern areas of Utah, and migrate north each spring.



Adult moths are small (1/3 inch), slender, and gray-brown in color with folded wings that flare outward. Mature larvae are about 1/3 inch-long with a pale green body that is pointed at both ends. They wiggle vigorously when disturbed. Adults overwinter in the warmer southern areas of Utah, and migrate north each spring. There are four to six generations per year.



Diamondback moth larval damage includes irregular holes in foliage, skeletonization, or complete defoliation.



Diamondback moth larva



- Monitor. Scout weekly for imported cabbageworms by randomly checking one out of ten plants (10%) in small fields, and one out of 100 plants (1%) in fields > 1 acre. Look on the undersides of leaves for small larvae and eggs. Look for feeding holes; search for larvae nearby and inside damaged heads.
- Handpick caterpillars. Where practical (in smaller fields), physically remove larvae when plants are young or when only a few are present.
- Use floating row covers. Apply covers before imported cabbageworms are present to prevent adult moths from laying eggs on plants. Remove covers during flowering to allow for pollination. This option is only practical for home gardens and small commercial fields.
- Sanitation. Clean fields of plant debris after harvest, thus removing overwintering sites for pupae.
- Manage weeds to remove overwintering sites for pupae. Weed hosts for looper caterpillars include wild mustard, peppergrass, and shepherd's purse.



Adult diamondback moth

Insecticides containing *Bacillus thuringiensis* var. *kurstaki* (Bt) and spinosad are effective in suppressing cabbage looper larvae. Bt must be applied when larvae are still young (< ½-inch long), and plant coverage is important as Bt must be ingested by larvae to be effective.

When more than one cabbage looper larva is found in one out of ten monitored plants (10%), treat just before heading or at Brussels sprout formation. Seedlings only require treatment if medium- to large-sized caterpillars are present, and defoliation (loss of plant tissue) exceeds 10%.

Flea Beetles



Active Now: Adults become active mid-late spring when host plants become available.



Flea beetles get their name because adults are able to jump with their hind legs. Various species range in color from black, bronze, metallic, and grey. Some even have stripes. Larvae are small, white, and worm-like with a brown head. Adult flea beetles can grow up to 3mm long. There are typically 1-3 generations per year. Adults emerge from early April to mid-June from overwintering on weeds. Flea beetles are an annual problem in the state.



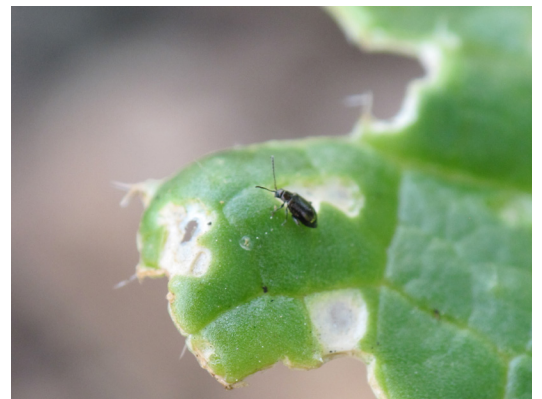
Both the adults and larvae have chewing mouthparts. Their feeding causes shallow pits and small round holes in the foliage, cotyledons, and stems. Some species' larvae will feed on the roots and tunnel into root vegetables.



- When to consider treatment: In seedlings, when 1-5 beetles per plant or defoliation reaches 10-30%.
- Sanitation. Clean fields of plant debris after harvest, thus removing overwintering sites for pupae.
- Manage weeds. A wide variety of weed species serve as an alternate host for flea beetle species.
- Use row covers during seedling establishment.
- Eliminate old crop debris and other surface trash.
- Apply insecticides if damage escalates.



Close up image of an adult flea beetle



Foliar feeding damage caused by flea beetle

ABIOTIC CONDITIONS

Cold Injury



Areas of high elevations are still at risk for cold nighttime temperatures. Monitor the forecast regularly.



Cold injury occurs when vegetable crops are exposed to very low temperatures. These temperatures, in combination with other environmental factors, can cause leaf tissue damage and reduced of flower formation and fruit production. Damaged leaf cells appear as interveinal brown spots on young plants, while leaves on established plants may become discolored.



Although cold injury is not detrimental, plant growth can be stunted and actively growing fruit may be damaged under prolonged cold periods. To avoid injury, transplant vegetables after the danger of frost has passed and when nighttime temperatures are consistently warm. Follow weather forecasts closely in the spring and fall and cover plants for protection as needed. Low tunnel or floating row covers can be added to raise the ambient air temperature around the plant during cold nights. Remove row covers as temperatures rise during the day to reduce humidity and avoid extreme heat (over 90°F).



Cucurbit transplant affected by the cold



Newly germinated corn affected by the cold

Integrated Pest Management Tip

Continue to build your knowledge on integrated pest management. Participate in USU Extension's virtual Vegetable IPM Twilight Meetings. This is a great opportunity to learn from the experts and share your questions and ideas with other vegetable producers. Free registration information is available in the initial advisory email.

