

Insect Information

Grasshoppers and Mormon Crickets numbers have been reported to be high in some areas of Utah. These insects can be big pests not only on vegetables, but field crops and rangelands as well. Communities need to work together to control grasshopper and Mormon Cricket when outbreaks occur. If one person is spraying and neighbors are not, the insects will just continue migrating from adjacent property.

Grasshoppers

Grasshoppers go through simple metamorphosis (i.e., egg, nymph, adult) and have chewing mouthparts. Most grasshoppers in Utah have one generation each year. Eggs are laid in the soil in summer and fall, and typically hatch the following spring. The eggs are laid in groups held together in a pod formed from a sticky secretion to which loose soil becomes bound. Eggs hatch in the spring depending on temperature. Immature grasshoppers, called nymphs, go through five instars before becoming adults. The nymphs are flightless, but will gradually develop small wing pads. Most adults are capable of flying great distances.

Feeding/Damage

There are two main grasshoppers out right now causing damage in vegetable gardens; the two-striped grasshopper (*Melanoplus bivittatus*) and the migratory grasshopper (*Melanoplus sanguinipes*).



Two-striped grasshopper (*M. bivittatus*). Adults are 1¼ - 2" long, and prefer tall, lush, herbaceous vegetation, and reside in ditch banks, roadsides, and crop borders. This species can be a major pest in small grains, alfalfa, and corn. It is one of the first species to appear each season.



Migratory grasshopper (*M. sanguinipes*). Adults are 1" long and prefer forbs, grasslands, and meadows. This grasshopper causes more crop damage than any other species of grasshopper on small grains, alfalfa, clover, vegetables, and ornamentals.

Grasshoppers have chewing mouthparts that tear away plant tissue. Grasshopper injury is most often associated with rangeland, corn, small grains, and vegetable crops. However, during heavy infestations almost any type of plant may be attacked, including trees, shrubs, ornamentals, flowers, and turfgrass. Grasshoppers are commonly thought of as foliage feeders, but will also feed on flowers, fruits, seed heads, stems, and essentially all above ground plant parts. Often fence rows and roadsides adjacent to crops serve as the major sources of grasshoppers; as the vegetation dries up in such areas, grasshoppers that hatched and matured there move into adjacent crops.



Injury from grasshopper feeding results in large irregularly shaped holes (left) and can be especially devastating to young seedlings, leaving plants almost completely defoliated (right).

Insect Information, continued from previous page

Management

Row covers, made from a lightweight fabric, can be used for sensitive edible plants such as vegetables and herbs to exclude grasshopper feeding. Covers on vegetables that require insect pollination, such as squash, must be opened during the morning hours when pollinators are most active to ensure good fruit set. In the fall, till soil to expose eggs which are destroyed when exposed to the cold. Lawns also can be raked to expose grasshopper eggs.



Grasshoppers are more easily managed when they are young before they develop wings and can fly (see wingless nymph above).

Chemical Treatment Options

Mobility increases after the 4th instar, so insecticide treatments are not as effective on 5th instar, or adult stages. The best time, therefore, to control grasshoppers is when they are young, before they have wings and can fly away.

1. Bait + insecticide:

- wheat bran + carbaryl or Nosema locustae (a natural grasshopper pathogen) that must be consumed
- spread evenly through the habitat, grasshoppers eat the bait as they are foraging for food
- easy to apply, but expensive
- selectively kills only grasshoppers and other foraging insects
- must be reapplied frequently and immediately following wetting events (rain, sprinkler irrigation)
- very effective option

2. Dust (carbaryl):

- easy to apply, but expensive
- does not readily adhere to foliage and must be reapplied frequently

3. Sprays (malathion, carbaryl, permethrin, bifenthrin):

- less expensive, but must have the equipment to apply
- adheres to plant material
- kills on contact, or when grasshoppers eat foliage

Mormon Crickets

Mormon crickets are not actually crickets; they are shield-backed, short-winged katydids. Adults and nymphs of Mormon crickets have long antennae and a smooth, shiny exoskeleton in a variety of colors and color patterns. Adult Mormon crickets are 1 ½ to 2 inches long.

Females lay eggs singly in the summer which are dormant through winter. These eggs then hatch and nymphs emerge in the early spring. Mormon crickets pass through several immature stages before becoming an adult, which can occur within 60 to 90 days depending on temperatures and other environmental conditions.

Drought encourages Mormon cricket outbreaks and cause substantial economic losses to rangeland, cropland, and home gardens. This is particularly true as adults and nymphs of Mormon crickets migrate in a band, eating plants along their path.



The adult female has a long ovipositor (egg layer) with a gentle upward curve.

Feeding/Damage

Mormon crickets feed on more than 400 species of plants, but prefer succulent forbs. Home gardens are usually not damaged by Mormon crickets, but in outbreak conditions migrating bands of feeding Mormon crickets may cause damage to garden plants as they pass through. These migrating adults often stay at one site about three or four days. As flightless insects, they crawl and hop, moving during favorable conditions, mainly in daylight hours when skies are clear and temperatures range between 65°F to 95°F. They seek shelter under plants and remain inactive when conditions are very hot, cloudy, and cold. They also stop at night, unless it is warm, in which case they may move.

continued on next page

Insect Information, continued from previous page

Management

When needed, plants should be protected from Mormon cricket feeding. Fabric row covers can be used to exclude these insects from feeding on your garden plants. If there has been a problem with these insects during the summer months, rake lawns, and turn over or till soil in garden beds to expose eggs in the fall. Eggs will be more susceptible to dehydration and death and in turn decrease the overwintering population.

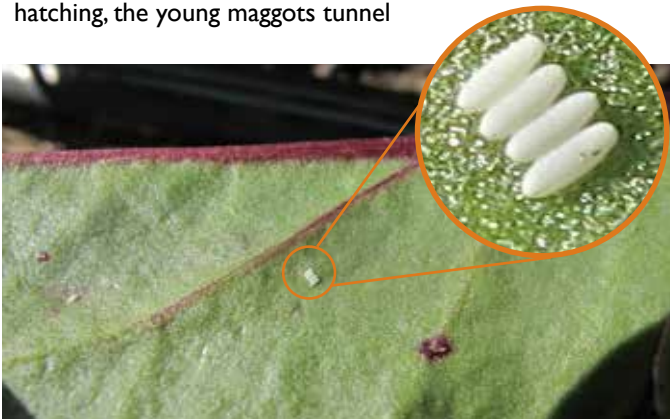
Chemical Treatment Options

Carbaryl bait may be applied around the perimeter of properties, such as fields, gardens, and landscapes as a protection. Bait can usually be purchased by home owners from private suppliers. Mormon crickets cannibalize their dead and injured. Consequently, carbaryl bait ingested by one Mormon cricket that dies may kill a second or third with subsequent feeding among the horde. Other pesticides including insect growth regulators, are also available. Malathion can also be sprayed on vegetables when Mormon crickets invade.

Leafmining Insects:

Injury from leafmining insects is being seen on beets and other leafy vegetables. Immature stages of many different groups of insects share the leafmining habit including the larvae of various flies, small moths, beetles, and sawflies. They are often classified by the pattern of the mine they create. The two most commonly found leafmining insects that cause problems in gardens include the spinach leafminer (*Pegomya hyoscyami*) and the vegetable leafminer (*Liriomyza sativae*).

The larvae of spinach leafminers are cylindrical, pale-colored maggots found in leaf mines. Adults are small (about 1/5 to 1/3 inch) gray or grayish brown flies. Spinach leafminers overwinter in the soil as pupae and emerge in mid spring. The adult flies lay small masses of white eggs on the undersides of older leaves. Upon hatching, the young maggots tunnel



Spinach leafminer eggs

into the leaves, where they feed, typically for 2 to 3 weeks. When maggots are fully grown, they cut through the leaf and drop to the ground and pupate in the soil.

Adult vegetable leafminers are small (about 1/15 inch) yellow and black flies. Larvae are pale, and slightly greenish. Adults insert eggs into foliage, producing small puncture wounds. Larvae feed and develop within the leaf tissue. Under warm temperatures, larvae may complete development in less than 2 weeks. When larvae are mature, they cut the leaf surface, drop to the soil, and pupate.

Feeding/Damage

These insects tunnel between the upper and lower leaf surfaces, feeding on the soft inner tissue and avoiding the tough epidermis. Spinach leafminers leave dark blotchy mines while vegetable leafminers make thin, meandering serpentine mines. Common hosts of the spinach leafminer include spinach, chard, beet, lambsquarter, and related weeds. Common hosts of the vegetable leafminer include many vegetables such as bean, tomato, potato, onion, pepper, squash, and melon.



Leafminer injury can appear as thin winding mines (left) or big blotchy mines (inset) depending on the species and/or maturity of the larva.

Management

Weed control is the first line of defense. Both species of leafminers also feed on lambsquarters, chickweed, nightshade, and *Amaranthus* species.

Check plants regularly for the presence of eggs and/or growing larvae (tunnels). Eggs can be crushed by hand and leaves with larvae should be pruned out or picked and destroyed. If infested leaves are left on the ground, larvae will still be able to finish development.

Insect Information, continued from previous page

Crop rotation and removing infested leaves can also help to reduce the population and damage.

Row covers applied just before and during egg-laying (June, August) will exclude flies and protect plants.



Row covers are used to exclude many insects including grasshoppers, leafminers, and flea beetles

Chemical Treatment Options

Chemical control is not recommended unless leaves are to be used for consumption. (Homeowners, however, can cut away mined portions.) If used, chemicals are only effective when timed with egg deposition or hatching.

Look for eggs or the start of new mines to determine when to start treatment. Repeat treatment in 7-10 days.

Commercial Growers: abamectin (Agri-mek), chlorantraniliprole (Coragen), flonicamid (Beleaf), imidacloprid (Provado),

Residential Growers: malathion (Bonide, Ortho Max), insecticidal soap (Safer's, Bayer Natria), pyrethrin (Monterey Take Down, Garden Tech Worry Free), spinosad^o (Bonide, Fertlome, Monterey Garden Spray)

Flea Beetles:

There are three common species of flea beetles that are actively feeding now on a variety of vegetable crops, including the tobacco flea beetle, palestriped flea beetle, and the western black flea beetle.

Flea beetles are small, shiny, and have large rear legs that allow them to jump like a flea when disturbed. They spend the winter as adults in plant debris or under soil clods and become active early in the spring. Females lay clusters of eggs in small holes in the roots, soil, and leaves of many different plants. Small white larvae hatch from the eggs and begin feeding on the roots of newly planted seedlings. Larvae will then pupate in the ground. There are about one to two generations each year. Flea beetles are common in

home gardens on plants such as broccoli, cabbage, radishes, eggplant, melons, peppers, potatoes, spinach, tomatoes, and turnips.



Tobacco flea beetle

Feeding/Damage

Adult flea beetles, which produce the majority of injury, chew holes or pits into leaves and cotyledons. On plants with thinner leaves, such as mustard and potato, adult feeding causes small, rounded holes characteristically described as "shot holes" (1/16 to 1/8 inch in diameter) on plants with leaves that are waxy and thick, such as broccoli, injury appears as pitting.



Palestriped flea beetles feeding on a potato plant.

Young plants and seedlings are particularly susceptible to this type of injury; growth may be seriously retarded and plants may even die. Leaf feeding by adult flea beetles also damages plant appearance which is important among certain ornamentals and leafy vegetable crops. Plants commonly attacked by flea beetles include tomato, eggplant, potato, peppers, turnips, radish, rutabagas, parsnip, collards, kale, swiss chard, broccoli, brussels sprouts, cauliflower, and beets.

Insect Information, continued from previous page



Characteristic shothole damage on seedling caused by flea beetles

Management

Make sure the seedbed is prepared well, this will accelerate seedling growth. Floating row covers or other screening can exclude the beetles during seedling establishment. In isolated plantings, thick mulches may also help reduce the number of flea beetles by interfering with activity of the root and soil stages.

Chemical Treatment Options

On established plants, there needs to be at least 10 to 20 percent of the leaf area destroyed before there is any effect on yields. The plants most likely to benefit from chemical treatment are the more sensitive seedlings, and plants grown for edible greens or ornamental purposes. Most flea beetle treatments are applied as foliar sprays. Since plants produce continuous new growth and the highly mobile beetles can rapidly reinvade plantings, insecticides usually have to be reapplied after a week.



Chemical treatments for flea beetles come in a variety of forms including powders (above) and foliar sprays.

Commercial Growers: azadirachtin (Azatrol^o, Ecozin^o, Molt), bifenthrin (Hero, Tundra), spinosad (Success, Entrust^o), permethrin (Ambush, Pounce), pyrethrin (Pyganic), neem oil, and diatomaceous earth.

Residential Growers: carbaryl (Sevin), bifenthrin (Monterey, Ortho Bug-B-Gone), spinosad (Green Light, Monterey Garden Spray), permethrin (Bayer Advanced Complete Insect Killer, Bonide Eight), pyrethrin (Fertilome Triple Action Plus, Ortho Garden Insect Killer, Worry Free Home Pest Control), neem oil and diatomaceous earth

For more information on flea beetles see the Utah Pest fact sheet [Flea Beetles on Vegetables](#).

Thrips:

Thrips damage was observed in many vegetable growing areas in the state. Thrips are tiny insects (about 0.04 inch) with fringed wings. They overwinter as adults and begin

feeding in the spring when temperatures warm. Thrips reproduce rapidly especially in hot, dry conditions.



Thrips are small about 1 mm in length

Thrips eggs are deposited inside the leaf tissue and cannot be seen with the naked eye. Thrips can complete one generation (egg to adult) in 3 to 4 weeks during the summer months. Adults and nymphs can be found on the underside of leaves or in tight spaces such as the neck of onions.

Feeding/Damage

Thrips have a broad host range, but severe damage from feeding usually occurs exclusively on onions, garlic, cauliflower, cabbage, snap beans, cucumbers, melons, and tomatoes in the home garden. Thrips feeding damage may vary depending on the host plant, but generally causes white to silvery streaks on the foliage and may lead to the plant withering and reduced bulb size (onion and garlic) due to loss of plant vigor. Thrips can also vector viruses such as the iris yellow spot virus (IYSV), tomato spotted wilt virus (TSWV), and impatiens necrotic spot virus (INSV).

Insect Information, continued from previous page



Thrips feeding leaves white, silvery patches with "tar" spots

Management

Thrips populations usually increase rapidly in July, so it's important to monitor and prevent thrips numbers from escalating. Spray thrips off plants with water from a hose, or use overhead sprinklers. This method is especially effective on immature thrips which don't have wings and can't fly back on the plant to feed more. Use mulches, such as straw, to provide a barrier and enhance natural thrips predators.

Chemical Treatment Options

Thrips can develop resistance to insecticides rapidly so it's important to use various management practices in addition to chemical treatments.

Commercial Growers: azadirachtin (Azatin, Aza-direct), spinosad (Success, Entrust^o), spinetoram (Radiant), spirotetramat (Movento), insecticidal soap (Safer's, M-pede), kaolin clay (Surround), permethrin (Ambush, Pounce)

Residential Growers: kaolin clay (Surround), insecticidal soap (Safer's, Bayer Nutria), pyrethrin (Monterey Take Down, Garden Tech Worry Free), spinosad (Green Light, Monterey Garden Spray)

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