

Disease Information

Alfalfa Mosaic Virus in Potato

Alfalfa mosaic virus (AMV) usually affects an occasional plant and is normally no cause for concern, but it can become a big problem when potatoes and other related vegetables are planted near alfalfa or clover. AMV is potyvirus transmitted by aphids in a non-persistent manner (i.e. short period of time; minutes to hours). AMV causes a distinct calico pattern (yellow blotching) on leaves. Some strains of the virus can cause severe stunting and stem and tuber necrosis.



Symptoms of AMV on potato leaves.

Management

Since AMV is a nonpersistent virus and is transmitted quickly by aphids, the use of insecticides to control spread is generally not effective. The best strategy to control AMV is to use seed potatoes certified to have low virus content and avoid planting potatoes near alfalfa or clover. Mineral oils can be used to reduce spread by aphids, but must be re-applied at frequent intervals to be effective. Minimize mechanical spread by sanitizing equipment and reducing traffic through the field. Infected plants can serve as a source of inoculum for the rest of the field, pull out symptomatic plants and dispose them. Solanaceous plants such as tomatoes, peppers, nightshade and ground cherry can harbor the virus and serve as a source of inoculum.

Bacterial Spot on Peppers and Tomatoes

Although Bacterial Spot is not commonly found in Utah, with the warm, moist conditions we've had, it is present again this summer. Watch for Bacterial Spot on peppers and tomatoes when it's hot and thunderstorms move through such as we have had in the last week or so.



Bacterial spot on a tomato plant.

Management

Although management of bacterial spot is difficult, there are cultural practices that can help to minimize this disease.

Avoid overhead irrigation. This will slow the spread of the bacteria.

Remove cull piles from adjoining pepper or tomato fields.

Rotate crops. Crop rotation, especially after an outbreak, is important because the bacteria can survive in infected plant debris. Peppers should not be rotated with tomatoes that are also susceptible to the pathogen. For best results, rotate with non-related crops for a minimum of one year.

Use disease-free seed and transplants. This is the best management option. There is one pepper variety from Seminis Vegetable Seeds (PS 09942815 (with X10R™)) that has resistance to all ten races of the bacteria that are known to occur. Other pepper varieties are resistant to races 1, 2 and 3.

Chemical Treatment Options

The only chemical option is copper, which helps to stop the

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spread of the disease from plant to plant. Fixed coppers (Champ, Cuprofix, NuCop, Kocide, Kop-RSpray) can be used at 5 to 10 day intervals during wet weather. Sonata is a biological control that works as a bacterial antagonist. In many parts of the country, *X. vesicatoria* has become resistant to copper and treatments are ineffective. In Utah, resistant isolates of the bacteria to copper have not yet been found. It is not recommended to use sprays as a preventative measure as this will encourage resistance by the bacteria.

Gummy Stem Blight

This disease is caused by the fungal pathogen *Didymella bryoniae* and affects all cucurbit crops such as cucumber, watermelon, cantaloupe, squash, and pumpkin. The pathogen can also attack fruit, causing a disease known as black rot. The disease cycle begins when spores are released from fungal fruiting bodies after rain or heavy dews. When these spores land on leaves and stems, they infect through natural openings, wounds, or by direct penetration.

Young leaves of watermelon and melon are highly susceptible to infection, but cucumber and squash are resistant when young and become susceptible as they age. Infection is favored by free moisture and cool to moderate (68 to 77° F) temperatures, but continuous leaf wetness is essential for disease to progress significantly. The pathogen can be spread within and among fields by wind and splashing water, and survives between cucurbit crops in infested crop debris and diseased vines.



The first symptom of gummy stem blight is circular, brown lesions on leaves.

Gummy stem blight symptoms first appear on leaves as circular, tan to dark brown spots, with or without water-soaking. Lesions often develop first at leaf margins, but eventually entire leaves become covered with lesions. Stem lesions are circular in shape, and tan to dark brown in color. Stem cankers develop on cortical tissues and often produce

brown, gummy exudates. Small black specks, fruiting bodies of the fungus, are apparent on stem cankers. Seedlings can be killed from stem girdling. Lesions develop more slowly if infection occurs in older plants, and cankered vines wilt near mid-season. Fruit lesions appear as small, water-soaked spots that enlarge; gummy exudates are apparent on fruit. Gummy stem blight can reduce yield, quality, and marketability of fruit.



Small black specks (fruiting bodies of the fungus) can be seen on stem cankers.



Vines with cankers caused by gummy stem blight wilt near mid-season.

Management

Rotate all cucurbits out of infected areas for at least 2 years since the disease can survive in soil and un-decomposed plant material for that long. Choose non-host plants such as small grains or corn.

Remove all plant debris and burn or throw in the garbage.

If possible, deep plow infected areas post-harvest to ensure complete decomposition of all plant material.

If you grow your own transplants, sanitize everything (pots, ceiling, benches, etc.) with a 10% bleach solution.

If buying seeds, make sure the seeds are free of pathogens.

Insect Information

Insect Information

Psyllids

Potato/tomato psyllids pass through three life stages: egg, nymph (immature stage) and adult. The adult psyllid is about the size of a typical aphid, but is not as commonly seen in gardens unless collected with a sweep net or knocked onto a cloth placed around the base of the plants. Adult psyllids are striped with alternating dark and light bands. Eggs are small, 1/32 inch long. They are orange-yellow and supported by small stalks. They are much smaller than the stalked, white egg produced by lacewings, which also are common in gardens. Psyllid eggs are frequently deposited along leaf margins but may occur on either leaf surface. Newly hatched nymphs are yellowish but become progressively greener as they develop. When almost mature, nymphs are nearly the same color as leaves and are flat, elliptical and scale-like. Nymphs are most numerous on the undersides of leaves but can occur on shaded upper leaf surfaces.



Psyllid eggs are laid on small stalks along leaf edges.



Newly hatched nymphs are yellow, flat, and elliptical in shape.

Feeding/Damage

Damage from psyllids occurs when adults and nymphs feed on plant sap, injecting toxic saliva. Usually the first abnormal



Potato psyllids are about the same size as aphids, but up close they resemble miniature cicadas.



Symptoms from psyllid feeding also known as "psyllid yellows" include yellow and upward curled leaves.

condition is a slight discoloration (yellowing or purpling) along the midribs and the edges of the top leaves and the basal portion of these leaves also tend to curl upward. These symptoms collectively are known as "psyllid yellows".

As the condition progresses, the entire plant top changes to yellowish-green or purple-red, and foliar growth is stunted. The leaves remain small and narrow and tend to stand upright, giving the top of the plant a feathery appearance.

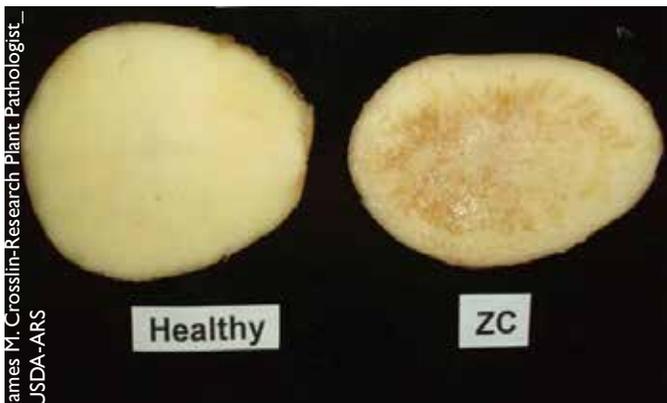
When the attack comes early in the development of the tomato plant, severe psyllid feeding may cause the plant to not set fruit. Late attack on tomato plants can cause production of an abnormal number of fruits that never attain a desirable size or quality. Problems with psyllids do not occur every season, but originate from winged, migrating forms of the insect. Outbreaks tend to be irregular, depending on weather conditions. Psyllids occur on tomato, potato, eggplant, and pepper and can cause significant damage.

Potato psyllids also transmit the bacterium pathogen that causes zebra chip disease of potato. Although potato psyllids have been in Utah for a long time, it was only recently (2013)

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that the bacterium was detected here. Tubers affected with zebra chip will appear normal and healthy on the outside, but brown striations can be seen when tubers are cut open.



A healthy potato (left) compared to a potato infected with zebra chip disease (right).

Management

Increased hairiness of the leaves tend to make plants less favorable to psyllids. Monitor plants often to ensure psyllid populations don't get out of control. As few as 15 nymphs per plant feeding for 5 days can cause psyllid yellows (or 5 nymphs feeding for 15 days). If you see adults, you may need to apply a chemical treatment.

Control of zebra chip disease is through management of psyllids early in the season with applications at planting of imidacloprid and later in the season with abamectin.

Chemical Treatment Options

While plants are in bloom, spray only in early morning or evening to avoid harming pollinators.

Commercial Growers: abamectin (Agri-Mek); imidacloprid (Admire Pro, Leverage, Nuprid); spinosid (Entrust, Success).

Residential Growers: sulfur dust, permethrin, esfenvalerate.

Survey of Zebra Chip Disease

Claudia Nischwitz is conducting a survey for Zebra chip disease this summer. If you have any plants with symptoms of zebra chip disease or psyllid feeding and you would like someone to come out and investigate it further contact either Bonnie Bunn (bonnie.bunn@usu.edu) or Claudia Nischwitz (claudia.nischwitz@usu.edu).

Western Corn Rootworm

Adults are about 1/4" long, and have yellow bodies with three black stripes on the forewings. Sometimes the black stripes overlap making the wings appear solid black. Females are slightly larger and will have an extended ovipositor. Adults will congregate on corn to mate and feed, but are easily disturbed and will drop from corn silks as you walk to a plant.



Western corn rootworm adult.

Western corn rootworms have one generation per year. In late summer, mated females deposit small egg clutches near the base of corn stalks, where they remain unhatched for the winter. Females can lay between 500 and 1,000 eggs during their lifetime. Eggs must go through a cold period, called diapause, before hatching in late spring.

Newly hatched larvae move down into the soil and begin feeding on secondary corn roots. Larvae go through three instars and eventually start feeding on and in the primary corn roots. In July, larvae pupate in the soil, emerge as adults

Feeding/Damage

The larval stage is the most damaging phase of the western corn rootworm's life cycle. Larvae feed on corn roots disrupting the plants' ability to take in water. Larval feeding can lead to a reduction of yield by 10% or more. Initially, injured root tips will be discolored or have brown lesions; over time, primary or secondary roots can be completely clipped. These damaged roots cannot absorb water as effectively as healthy roots.

Heavy larval infestations can cause extreme "goosenecking" or lodging of corn stalks, making harvest difficult. Damaged corn roots are also more likely to get root and stalk fungal diseases. Although adults will feed on corn leaves and silks economic damage from adults is rare. More often adults will clip corn silks before pollination, which can result in poorly filled ears.

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Management

Monitor populations. Monitoring using whole plant counts and sticky card traps can help monitor peak adult emergence during silking and pollen shed and are also helpful in predicting larval damage the following year.

Rotate crops. Rotating corn with other crops every 3 years minimizes larval survival and subsequent root damage.

Plant early. Corn planted early may help disrupt the timing of adult emergence with corn silking, making the corn less attractive.

Chemical Treatment Options

Treat Seeds. Corn seeds treated with an insecticide can reduce light to moderate corn rootworm feeding pressure.

Treat Soil. Using granular insecticides at the time of planting can effectively reduce corn rootworms. In-furrow or banded applications work best if followed by cultivation and irrigations. Insecticides with bifenthrin or chlorpyrifos can be incorporated into the soil.

Lygus Bugs

Lygus bugs (also known as the tarnished plant bug) are abundant in some areas in the state right now. They overwinter as adults, and can be found in dead weeds, leaf litter, under tree bark, in rock piles in fields, stream and ditch banks, and road rights-of-way. Adults become active in early spring and feed on newly developing buds and shoots. Eggs



Adult lygus bugs have a heart-shaped pronotum.

are often deposited in leaf petioles or at the base of the leaf blade. Yellowish-green nymphs emerge after 7 to 10 days of eggs being laid, and begin

feeding. Their life cycle is completed in three to four weeks, and there are two to three generations per year.

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Feeding/Damage

The lygus bug feeds on a variety of hosts including carrots, lima and snap beans, soybeans, and tomatoes. The lygus bug is among the most damaging of the true bugs and is known to vector the bacterial disease, fire blight, to various fruits through feeding wounds.

Lygus bugs use their needle-like mouthparts to extract plant juices. Their feeding causes shriveled seeds in carrot and premature drop of buds, flowers and fruits in tomato. Leaves from damaged buds are sometimes ragged and discolored. On cauliflower, the lygus bug can feed on many individual flower buds, causing bronzing on the head. Lygus bugs also cause cat-facing injury. This is caused by puncture feeding in flower buds and fruit resulting in unsightly dimpling, deformity, and scarring of fruit.

Management

The removal of preferred host plants from edges of fields and destruction of favorable overwintering sites will help to reduce the damages caused by the lygus bug. Preventing weeds from forming young buds and flowers will keep populations lower in the weedy areas. Once weeds flower and lygus bugs colonize them, the bugs will tend to remain in the weeds unless the weeds start to senesce, dry, or are mowed. Weed hosts include butterweed, fleabane, goldenrod, vetch, dock, and dog fennel.

Once the adults move into a crop, the type of management depends on the crop growth stage. When plants are vegetative, low densities can be tolerated. As plants begin to set buds, chemical controls may be needed. However, chemicals will have no effect on the egg stage inside of the plant tissue.

Chemical Treatment Options

Commercial Growers: azadirachtin (Aza-direct, Ecozin, Molt), bifenthrin + imidacloprid (Brigadier, Swagger), zeta-cypermethrin (Gladiator, Mustang).

Residential Growers: oils (Monterey All Natural Garden Insect Spray), pyrethrins + piperonyl butoxide (Worry Free Insecticide and Miticide), lambda-cyhalothrin (Spectracide Triazicide).

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