K-STATE
Research and Extension

Insect and Mite Pests of Vegetable Gardens

Vegetable crops grown in the garden are susceptible to a diverse array of insect and mite pests. Therefore, it is important to properly identify and manage these pests, though the specific pests and type of damage can vary by crop and the time of year. This publication explains how to detect potential problems and how to identify pests in vegetable gardens based on the type of plant damage. A discussion of pest life cycles provides information that can be used to select appropriate plant protection strategies.

Identification and Plant Damage

Inspect plants regularly throughout the growing season checking for insect and mite pests and plant damage. Most pests that feed on vegetable plants have either chewing or sucking mouthparts, which produce different types of feeding damage. For example, insect pests with chewing mouthparts feed on plant parts including: leaves, stems, flowers, fruits, and roots and physically remove plant tissues while feeding. Insect and mite pests with sucking mouthparts feed on plant fluids causing stunting, wilting, leaf distortion, and leaf yellowing.

Some insect pests leave physical evidence of their feeding and development. For example, caterpillars produce fecal deposits or frass (Figure 1), whereas sucking insects such as aphids and leafhoppers produce a clear, sticky substance called honeydew (Figure 2). In addition, aphids leave behind molting skins (Figure 3) that can be mistaken for whiteflies. Although some insect pests such as beetles and caterpillars only feed at night, their damage and/or fecal deposits are visible during the day.

In addition to direct damage caused by insect and mite pests, a number of insect pests such as aphids, leafhoppers, thrips, and certain beetles cause indirect damage by transmitting diseases (e.g., fungi or viruses) when feeding or by creating wounds that allow for infection by disease-causing organisms.

Insect and Mite Pest Life Cycles

Knowing the life cycle of a given insect or mite pest and the life stage that may be present on plants at a particular time helps anticipate when pest problems are likely to occur during the growing season. In addition, it is important to understand the life cycle (egg to adult) and be able to identify the life stages (larva, nymph, and adult) that are most susceptible to plant protection strategies. Furthermore, knowing the time of year (spring and summer) insect and mite pests are feeding on plants and how insect and mite pests survive the winter (overwinter) is helpful in effectively managing pests in vegetable gardens.

Some insect pests feed early in the growing season (striped cucumber beetle), whereas other insect and mite pests feed later in the growing season (stink bugs and twospotted spider mite). Insect and mite pests can overwinter as eggs, larvae, nymphs, pupae, or adults depending on the specific insect or mite pest. The overwintering stage determines

Figure 1. Fecal deposits (frass) on leaf associated with caterpillars.

Figures 2 and 3. Honeydew on leaf surface (left) and aphid molting skins (right).

when particular insect or mite pests will cause problems during the growing season. For instance, insects that overwinter as adults (bean leaf beetle and squash bug) are present earlier in the growing season than pests that overwinter as eggs (grasshoppers) or pupae (tomato hornworm, imported cabbageworm, corn earworm, and squash vine borer).

To avoid harming beneficial insects, it is important to properly identify the insect or mite pest before implementing plant protection strategies or applying a pesticide (insecticide or miticide). Table 1 lists insect and mite pests commonly encountered in vegetable gardens along with susceptible host plants. For more help identifying insect or mite pests, contact your local extension agent or university entomologist.

Plant Protection Strategies

Scouting

Vegetable plants should be inspected weekly throughout the growing season to detect insect and mite pests as soon as possible. Early detection reduces subsequent plant damage and helps to avoid pest outbreaks. Scouting efforts should focus on leaf undersides where most insect and mite pests are located.

Cultural

Plants that receive too much or too little water are more susceptible to insect and mite pests than plants that receive sufficient water. The same is true of plants that receive too much fertilizer, especially water-soluble, nitrogen-based fertilizers. Before applying any type of fertilizer to vegetable crops, request a soil test through your local extension office to determine if a fertilizer should be applied.

Remove plant debris from the garden, which provides overwintering sites for the adult stage of certain insect pests such as bean leaf beetle and squash bug. In addition, plant debris may be contaminated with plant diseases (fungi or viruses) that can be spread by certain insects.

Remove all weeds from the vicinity that can harbor insect and mite pests including: aphids, leafhoppers, and twospotted spider mite. Broadleaf weeds are susceptible to aphids and leafhoppers and can also serve as overwintering sites for certain insect and mite pests.

To keep insects or mites from spreading within the vegetable garden, discard and dispose of heavily infested plant material. The plant material can be burned or placed into sealed garbage containers. Do not incorporate infested plant material into inactive compost piles because insect and mite pests will not be killed.

Figure 4. A floating row cover can be used to protect vegetable crops from certain insect pests.

Physical/Mechanical

Caterpillars, beetles, and bugs can be removed from plants quickly and easily by handpicking and then placing them into a container of soapy water. Rubber or leather gloves should be worn for protection from substances emitted by certain insect pests such as blister beetles, which can burn the skin.

Applying a forceful water spray directly onto vegetable plants, especially to leaf undersides, is effective in dislodging certain insect and mite pests. Applied with enough force, the water will physically harm most soft-bodied insect (aphids) and mite (twospotted spider mite) pests.

Protective barriers or floating row covers (Figure 4) can be placed on plants to protect them from different insect pests including beetles and caterpillars. The barriers or row covers allow rain and sunlight to enter, but they need to be removed from cucumbers and other flowering vine crops to allow for pollination by bees. All edges of the row cover should be firmly secured to keep insect pests from crawling underneath.

Plants known to attract certain pests (trap plants) can be located near vegetable plants (Figure 5) to lure insects away from desirable plants. To be effective, trap plants should be more attractive to insect pests than the main vegetable crop(s). For example, 'Blue Hubbard' squash attracts striped and spotted cucumber beetle, squash bug, and squash vine borer adults away from cucurbit crops. In addition, dill, marigold, nasturtium, radish, and zinnia may be used as trap plants. Trap plants may have to be discarded when they are no longer a viable food source and do not prevent insect pests from moving to the main crop. Trap plants can be removed by hand or sprayed with an insecticide.

Figure 5. Trap plants (marigolds) placed around vegetable plants.

Pesticides

Pesticides (insecticides and miticides) for use in vegetable gardens either kill insects on contact or act as stomach poisons. Insects must consume stomach-poison insecticides to be negatively affected. Contact insecticides or miticides kill insect or mite pests that have been directly exposed to applications, or insect or mite pests that walk or crawl over a treated surface and encounter residues on the leaf. Broad-spectrum pesticides kill a wide range of insect and/or mite pests. These include insecticidal soaps (potassium salts of fatty acids) and horticultural oils (petroleum, mineral, or neem-based). The disadvantage of broad-spectrum pesticides is that they can kill beneficial insects, whereas narrow-spectrum pesticides only kill certain types of insect or mite pests. For example, the bacterium Bacillus thuringiensis subsp. *kurstaki* (*Btk*) only kills caterpillars and does not harm beneficial insects.

To maximize effectiveness, consider the following when applying pesticides:

- **Timing:** Apply pesticides (insecticides and miticides) when the most susceptible life stages (larvae, nymphs, and adults) of a given insect or mite pest are present.
- **Coverage:** When spraying a pesticide, all plant parts including leaves, stems, flowers, and fruits should be covered thoroughly. Spray leaf undersides where the life stages (egg, larva/nymph, and adult) of most insect and mite pests are located.
- **Frequency:** Apply pesticides as directed on the label. Application intervals and frequency vary according to the residual activity (persistence) of the pesticide.

Always read the label before purchasing and mixing any pesticide. When applying pesticides, be sure to wear appropriate personnel protective equipment, and to avoid drift, do not apply pesticides when wind speeds exceed 5 miles per hour.

Table 1. Insect and mite pests of vegetable gardens and susceptible host plants.

Aphid

Susceptible host plants: Beans, celery, cole crops[a], corn, cucurbits[b], eggplant, lettuce, pea, pepper, potato, spinach, and tomato

Colorado potato beetle larva (left) **and adult** (right)

Susceptible host plants: Eggplant, pepper, potato, and tomato

Asparagus beetle

Susceptible host plants: Asparagus

Flea beetle

Susceptible host plants: Bean, carrot, celery, cole crops[a], corn, cucurbits[b], eggplant, lettuce, pea, pepper, potato, spinach, and tomato

Bean leaf beetle

Susceptible host plants: Beans and peas

Grasshopper

Susceptible host plants: Bean, eggplant, and pea, pepper, and spinach

Blister beetle

Susceptible host plants: Bean, carrot, cole crops[a], corn, cucurbits[b], eggplant, onion, pea, pepper, potato, spinach, and tomato

Harlequin bug

Susceptible host plants: Beans, cole crops[a], corn, cucurbits[b], eggplant, lettuce, potato, and tomato

Cabbage looper

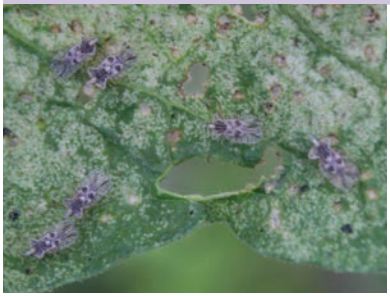
Susceptible host plants: Bean, celery, cole crops[a], lettuce, pea, potato, spinach, and tomato

Imported cabbageworm

Susceptible host plants: Cole crops[a] and spinach

Corn earworm

Susceptible host plants: Bean, corn, lettuce, pea, pepper, and tomato



Lace bug

Susceptible host plants: Eggplant, potato, and tomato

Table 1. Insect and mite pests of vegetable gardens and susceptible host plants.

Leafhopper

Susceptible host plants: Bean, carrot, celery, cucurbits[b], eggplant, lettuce, pepper, spinach, and tomato

Striped cucumber beetle

Susceptible host plants: Cucurbits[b] and tomato

Lygus bug/tarnished plant bug

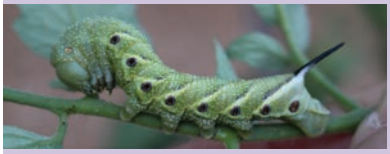
Susceptible host plants: Bean, celery, cole crops[a], cucurbits[b], eggplant, lettuce, pepper, potato, and spinach

Thrips

Susceptible host plants: Bean, carrot, celery, cole crops[a], cucurbits[b], onion, pea, and tomato

Squash bug

Susceptible host plants: Cucurbits[b]



Tobacco (top) **and tomato hornworm** (bottom)

Susceptible host plants: Eggplant, pepper, potato, and tomato

Squash vine borer

Susceptible host plants: Cucurbits[b]

Twospotted spider mite

Susceptible host plants: Beans, cucurbits[b], eggplant, pea, pepper, and tomato

Spotted cucumber beetle

Susceptible host plants: Beans, corn, cucurbits[b], pea, and potato

[a] Cole crops: brussels sprout, cabbage, cauliflower, collards, kale, kohlrabi, mustard, and broccoli.
[b] Cucurbits: cucumber, melons, pumpkin, squash, and zucchini.

Beneficial Insects

A number of beneficial insects prey on insect and mite pests in the vegetable garden during the growing season. Beneficial insects include parasitoids (parasitic wasps) and predators. Parasitoids feed on only one insect or mite pest or on a particular life stage (egg, larva, nymph, or adult). Most predators feed on a wide variety of insect and mite pests and different life stages (egg, larva, nymph, and adult).

Parasitoids are difficult to see because of their small size (Figure 6), but they will parasitize caterpillars and aphids. For example, the female parasitoid inserts eggs into aphids using an egg-laying device called an ovipositor. A larva hatches from the egg inside the aphid and begins feeding from within. Feeding eventually leads to the formation of parasitized or mummified aphids (Figure 7).

Predators are generally easy to see in the vegetable garden and include ladybird beetles (Figures 8), green lacewings (Figure 9), pirate bugs (Figure 10), big-eyed bugs, and hover flies (Figure 11). In general, the larva/nymph and adult life stages are predaceous. However, this is not always the case, as adult green lacewings (Figure 12) and hover flies (Figure 13) do not feed on insect pests. Spiders are predators but typically do not consume enough prey to affect insect pest populations. When present in high numbers, parasitoids and predators can regulate insect and mite pest populations and minimize plant damage.

Conservation Biological Control

Conservation biological control is the primary means of encouraging beneficial insects to remain in the vegetable garden. This practice is designed to protect, attract, or maintain existing populations of beneficial insects by incorporating plants that produce flowers that attract beneficial insects and supply nectar as a food source for adults

Figures 9 and 10. Green lacewing larva (left) and pirate bug adult (right).

Figures 6 and 7. Parasitoids or parasitic wasps (left) and parasitized or mummified aphids (right) on leaf underside.

Figure 11. Hover fly larva feeding on aphids.

Figure 8. Ladybird beetle adults (left) and larva (right).

Figures 12 and 13. Green lacewing adult (left) and hover fly adult (right).

Figure 14. Flowering plants that are attractive to beneficial insects.

(Figure 14). Plants that attract beneficial insects are listed in Table 2.

Using this approach, trap plants are placed in or around the perimeter of the vegetable garden to attract insect pests that provide food for beneficial insects. Once the beneficial insects become adults, they can move back and forth between the trap plants and the main vegetable crop(s). For example, when planted among vegetable crops, sweet alyssum (*Lobularia maritima*) (Figure 15) attracts certain aphid parasitoids and hover fly adults. Flowering plants differ in their attractiveness to beneficial insects but should bloom early enough to attract beneficial insects before pest damage occurs.

Table 2. Plants that produce flowers that attract beneficial insects.

Common Name	Scientific Name
Queen Anne's Lace	*Daucus carota*
Common yarrow	*Achillea millefolium*
Sweet alyssum	*Lobularia maritima*
Common buckwheat	*Fagopyrum sagittatum*
Dill	*Anethum graveolens*
Fennel	*Foeniculum vulgare*
Coneflower	*Echinacea* spp.
Tickseed	*Coreopsis* spp.
Garlic chives	*Allium tuberosum*
Annual black-eyed susan	*Rudbeckia* spp.
Golden chamomile	*Anthemis tinctoria*

Impact of Pesticides

Pesticides (in this case, insecticides) can harm beneficial insects that have been directly exposed to wet sprays or dried residues on leaves and/or flowers while foraging. Indirect exposure can negatively affect the ability of beneficial insects to effectively search for insect or mite pests. Therefore, pesticide applications should be avoided when beneficial insects are present.

Figure 15. Sweet alyssum in flower is attractive to aphid parasitoids and hover fly adults.

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MF3480 February 2020