UTAH PESTS fact sheet
EXTENSION
UtahStateUniversity

Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory ENT-225-21-PR March 2021

High Tunnel Pest Management - Aphids

Nick Volesky, Vegetable IPM Associate • Zachary Schumm, Arthropod Diagnostician

Quick Facts

- Aphids are small, pear-shaped insects with piercing-sucking mouthparts that feed on plant tissue. They can be found inside high tunnels all season long.
- Various species of aphids have a broad host range and can vector several viruses. Therefore, management in high tunnels can be challenging.
- Monitor for aphids in high tunnels by visually inspecting plants for colonies and feeding symptoms.
- Aphids can be managed in high tunnels through cultural, mechanical, biological, and chemical practices.

Aphids are a common pest that can be found on high tunnel crops such as fruits, vegetables, ornamentals, grasses, and weeds. Four aphid species commonly found in Utah in high tunnels are green peach aphid *(Myzus persicae)*, melon aphid *(Aphis gossypii)*, potato aphid *(Macrosiphum euphorbiae)*, and cabbage aphid *(Brevicoryne brassicae)* (Fig. 1).

DESCRIPTION

Aphids are small plant feeding insects in the order Hemiptera (the "true bugs"). Like all true bugs, aphids have a piercing-sucking mouthpart ("proboscis") that is used for feeding on plant structures. In general, aphids are pear-shaped, soft-bodied, and possess a characteristic pair of cornicles on the posterior end of their abdomen, allowing for easy identification (Fig. 2). They also have extended antennae for a small insect that can be lenthier than their entire body. Nymphs do not possess wings, and adults can be either winged or unwinged. Aphid species vary widely in color and size, and individuals of the same species can be different in color as they grow from the nymph to the adult stage. Color can also vary by season.

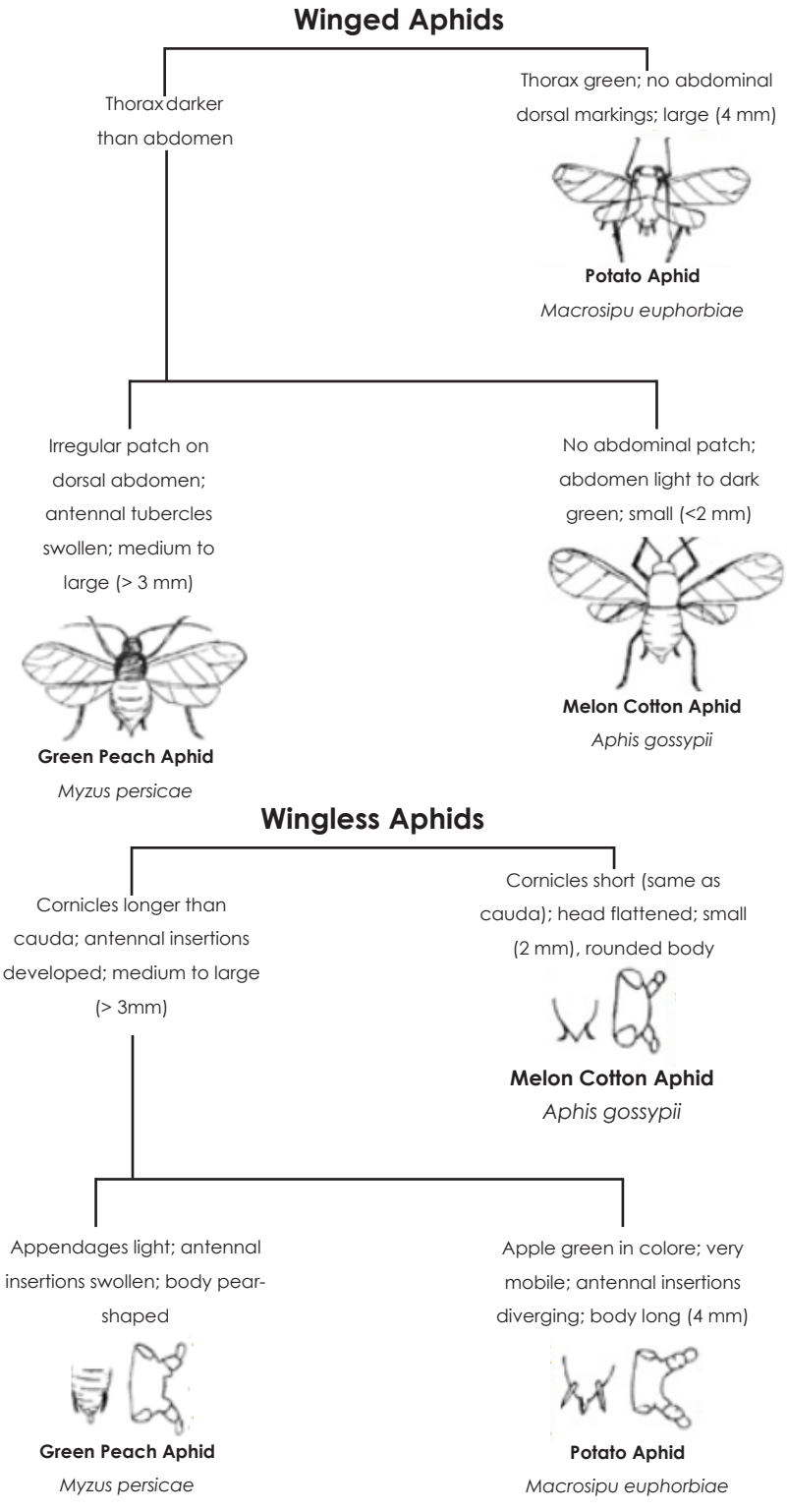

Fig. 1. Aphid identification key.

Green peach aphid
Description: Summer forms are often green-yellow and can be pale to vibrant (Fig. 2. Fall forms can be green to pink or red. Winged forms often have some black coloration on the top of their bodies. Size can range from 0.06 to 0.09 inch (1.5–2.3 mm).
High tunnel plant hosts: tomato, pepper, eggplant, squash, cucumber, cabbage, broccoli, and legumes.

Fig. 2. Green peach aphid wingless adult. Circle: cornicles, an identifying characteristic of aphids.

Melon aphid
Description: It is light to dark green or yellow and often pale. Winged adults are often black (Fig. 3). A smaller aphid, it reaches up to 0.06 inch (1.5 mm) long.
High tunnel plant hosts: cucumber, squash, pepper, eggplant, and other cucurbits.

Fig. 3. Melon aphids. Nymphs can be pale green to bright yellow.

Potato aphid
Description: It is pink or green in color (Fig. 4). A larger aphid, it measures 0.07 to 0.16 inch (1.8–4.1 mm) long.
High tunnel plant hosts: tomato, eggplant, pepper, pea, and beans.

Fig. 4. Potato aphid. Nymphs and adults can be green-pink in color.

Cabbage aphid
Description: It is usually green in color but can often appear gray due to a grayish, waxy protective covering produced by the insect. This species also has short cornicles (Fig. 5). Individuals can measure from 0.07 to 0.1 inch (1.8 to 2.5 mm) long.
High tunnel plant hosts: broccoli, cauliflower, cabbage, kale, collards, kohlrabi, radish, and kale.

Fig. 5. Cabbage aphids.

Other aphid species that may be found in high tunnels include:
Black bean aphid *(Aphis fabae)*
Corn leaf aphid *(Rhopalosiphum maidis)*
Cowpea aphid *(Aphis craccivora)*
Honeysuckle aphid *(Hyadaphis foeniculi)*
Currant-Lettuce aphid *(Nasonovia ribisnigri)*
Lettuce root aphid *(Pemphigus bursarius)*
Pea aphid *(Acyrthosiphon pisum)*
Plum-Thistle aphid *(Brachycaudus cardui)*
Turnip aphid *(Lipaphis erysimi)*
Willow-Carrot aphid *(Cavariella aegopodii)*

LIFE HISTORY

The life cycle of aphids is complex and can vary among species. In general, aphids overwinter as eggs. In the spring, eggs will hatch into first instar nymphs and are usually all females. They will begin to feed on host plants and will grow into subsequent nymphal stages. There are four nymphal stages prior to molting into the adult stage. The complete development of aphids can be very short, sometimes only taking a few days to hatch and grow to the adult stage.

The first several generations of females give live birth parthenogenetically (without mating) to other female aphids. This cycle continues several times throughout the spring and early summer. When populations on plants become too large for a particular host or environment, nymphs that will become winged females will be produced that travel to find new hosts to continue reproduction without mating. Closer to late summer and fall, the first winged males will be produced that will begin mating with winged females (Stern, 2010).

Once the mating generations are abundant, they will disperse to new hosts and lay eggs in the late fall. The cycle continues in the following spring. Figure 6 displays a generalized aphid life cycle.

DAMAGE

Aphids can feed on most plant structures, including buds, leaves, stems, fruits, and even roots. Feeding can cause structures to yellow and leaves to curl, overall reducing plant vigor (Fig. 7). In young plants, a heavy infestation can completely kill the plant. Aphids use piercing-sucking mouthparts to feed in the phloem that is packed with sugars and is highly pressurized within plant tissues. As they feed, the pressure causes the aphids to excrete honeydew (which may grow sooty mold), a sugary substance that can attract ants, further causing damage to plants. Ants can exacerbate aphid infestations because they will protect the aphids in exchange for a constant supply of honeydew.

Aphids can also introduce several viruses to plants, further reducing yield or causing plant death. Winged generations are the biggest concern for transmitting viruses to new plants, as unwinged generations aren't as mobile. For more information specific to aphid-vectored viruses, visit our Aphid Pests on Vegetables fact sheet.

Fig. 7. Leaf curl and yellowing caused by aphid feeding.

MONITORING

High tunnels create a protected environment that also extends the growing season. These ideal conditions are great for production but also favorable for aphid pests. Inside high tunnels, there tend to be both winged and wingless forms of aphids. They are often all asexually reproducing females. Monitoring for aphids should happen weekly throughout the season, from the seedling stage through harvest.

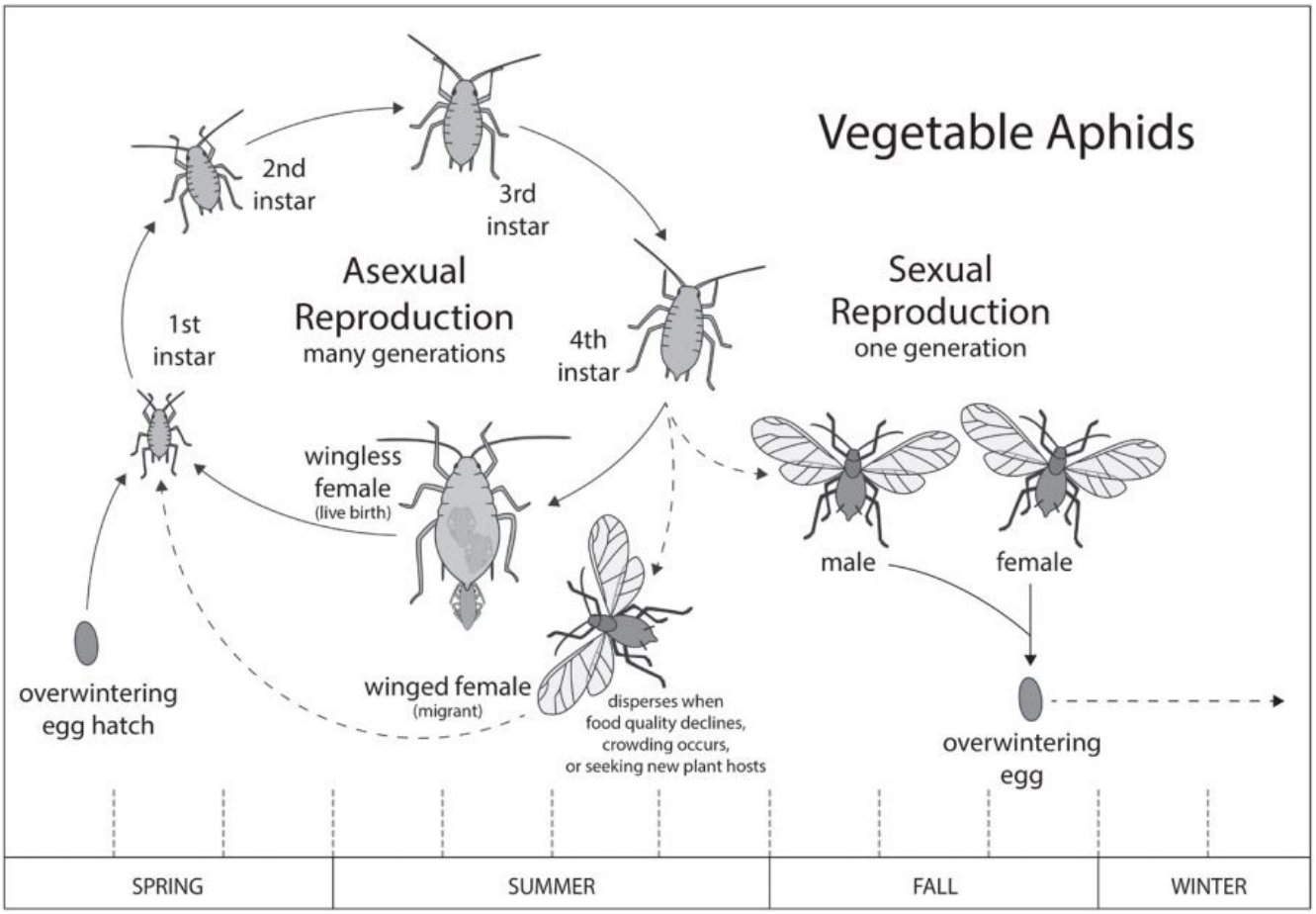

Fig. 6. Generalized life cycle of aphids in vegetable crops.

Fig. 8. Using a hand lens to identify small pests like aphids.

Fig. 9. Casted aphid skins (may be mistaken for whiteflies).

Fig. 10. Winged aphids caught on a yellow sticky trap.

- **Visually inspect plants for aphid colonies**, feeding symptoms on growing tips, and curled leaves. Most aphid species prefer the undersides of leaves, so be sure to turn foliage over when scouting. Use a 10-20x hand lens for species identification (Fig. 8).
- **Look for small white flakes**, which are the shedded skins of aphids (Fig. 9).
- **Yellow sticky traps** are effective to monitor for the presence of winged aphids. Place traps 4–6 inches above susceptible host plants (Fig. 10).
- **Monitor plants for various symptoms of viruses.** Vegetable viruses vectored by aphids include alfalfa mosaic virus, cucumber mosaic virus, potato virus Y, and watermelon mosaic virus.
- **Inspect transplants for aphids** before bringing them into the high tunnel.
- **Look for a sticky substance called honeydew** on leaves' stems. It is a sugary, sticky secretion from aphids. It can cause the growth of a black sooty mold.
- **Monitor for the presence of ants.** Ants feed on excreted honeydew from aphids, which can indicate high populations (Fig. 11).

MANAGEMENT

Cultural Control

- **Use preventive measures.** Before planting inside the high tunnel, remove weeds and volunteer crops that can serve as aphid hosts.
- **Encourage natural enemies.** Plant strips of yarrow, alyssum, herbs, and other plants with small, attractive flowers that provide nectar and pollen for beneficial insects. However, this may take up space inside the high tunnel for cash crop production (Fig. 12).
- **Inspect transplants.** Before planting inside of enclosed high tunnels, examine transplants for aphids.
- **Manage nitrogen levels.** High levels of nitrogen fertilizers tend to encourage aphid reproduction. Use several, staggered applications of lower concentrations of nitrogen rather than a single high dose. Also, use delayed-release formulations.
- **Expose the high tunnel to low temperatures.** During the unused winter months, use exposure to slow down or kill off any overwintering aphids or other pests.

Fig. 11. Ant eating secreted honeydew from aphids.

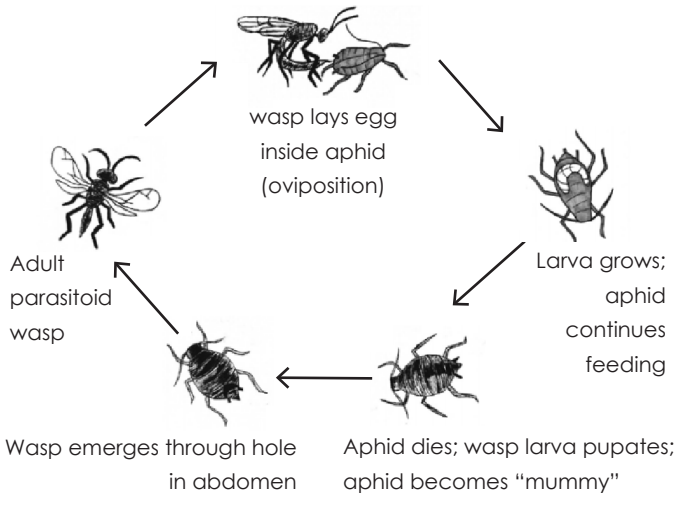

Fig. 12. Life cycle of aphid parasitoid wasp.

Biological Control

There are several natural predators that feed on aphids. It is important to scout for these predatory and parasitic insects and eggs in and around your high tunnels (Figs. 13 and 14). These natural predator populations can maintain aphids at low levels. However, predators will only show up if a food source exists, so there can be a lag time between the appearance of the aphids and the appearance of predators. Therefore, adjustments to the local environment and releases of beneficial insects may be needed to enhance their presence and effectiveness (Table 1).

Fig. 13. Damsel bugs feeding on aphid.

Fig. 14. Aphid killed by infection with *Beauveria bassiana*.

Chemical Control

When using insecticides inside a high tunnel, always read the product label to ensure use is permitted in enclosed structures like greenhouses or high tunnels.

Insecticides should only be used when needed. Rotate among different insecticide classes between applications as aphids are prone to developing resistance. Resistance has occurred with pyrethroids for populations of green peach aphid and melon aphid in agriculturally intensive areas of the United States. Some insecticides may kill the beneficial insects mentioned above.

Table 1. Examples of Aphid Natural Enemies

Common Name	Family	Scientific Name
Convergent lady beetle	Coccinellidae	*Hippodamia convergens*
Seven-spotted lady beetle	Coccinellidae	*Coccinella septempunctata*
Thirteen-spotted lady beetle	Coccinellidae	*Hippodamia tredecimpunctata*
Twice-stabbed lady beetle	Coccinellidae	*Chilocorus stigma*
Multi-colored Asian lady beetle	Coccinellidae	*Harmonia axyridis*
Transverse lady beetle	Coccinellidae	*Coccinella transversoguttata*
Black hunter thrips	Aeolothripidae	*Aelothrips* spp.
Mullein plant bug	Miridae	*Campylomma verbasci*
(no common name)	Miridae	*Deraecoris brevis*
Minute pirate bug	Anthocoridae	*Orius* spp.
European praying mantis	Manitdae	*Mantis religiosa*
Chinese praying mantis	Mantidae	*Tenodera sinensis*
Aphid parasitic wasps	Aphelinidae	*Aphelinus abdominalis*
	Braconidae	*Aphidius colemani*
	Braconidae	*Aphidius ervi*
	Braconidae	*Aphidius matricariae*
Predatory Gall Midge	Cecidomyiidae	*Aphidoletes aphidimyza*
Collops beetle	Melyridae	*Collops* spp.

Soldier beetle	Cantharidae	(no scientific name as these insects represent a whole family)
Long-legged flied	Dolichopodidae	
Syrphid fly	Syrphidae	
Green lacewings	Chrysopidae	
Brown lacewings	Hemerobiidae	
Dustywings	Coniopterygidae	
Red velvet mite	Trombidiidae	
Banded thrips	Aeolothripidae	
Assassin bug	Reduviidae	
Big-eyed bug	Geocoridae	
Damsel bug	Nabidae	

For additional biological control information reference the Aphid Natural Enemies and Biological Control fact sheet and *Greenhouse Biocontrol in Utah* guidebook.

Organic insecticides include insecticidal soap and oils (petroleum, mineral, canola, clove, garlic, rosemary, and neem). Oil and soap sprays kill aphids on contact by physical means (suffocation and disruption of waxes in the exterior cuticle), so thorough coverage is essential for good efficacy. These products may also kill beneficial insects but do not have residual activity. BotaniGard is a biological insecticide for commercial growers labeled for control of aphids. The active ingredient, *Beauveria bassiana*, is an entomopathogenic fungus that causes the white muscadine disease in aphids and other insects (Fig. 14). Insecticidal soap and horticultural oils are good options to treat aphids before populations increase to high levels. Thorough spray coverage is important for good aphid control (Fig. 15). It can be difficult to reach aphids on the underside of leaves or in curled leaves. Ground sprays using hollow-cone nozzles or air-assist sprayers will provide the best canopy penetration. Higher spray volumes are also helpful. See Table 2 for product options.

Fig. 15. Spraying insecticides for aphid control inside a high tunnel.

Caution: Do not use soap or oils on water-stressed plants or when temperatures will exceed 90° F within 4 hours of application. These materials may be phytotoxic to some plants, so always check the label. If unsure about phytotoxicity, test the spray on a few plants before treating an entire field. .

Reference the Utah Vegetable Production & Pest Management website for additional spray options for both commercial and home growers.

Table 2. Examples of Effective Insecticides Registered in Utah for Aphid Control in High Tunnels

Active Ingredient	Brand Name	MoA*	Residual Days
bifenthrin	Ferti-lome Broad Spectrum Insecticide, Bonide Eight Insect Control	3	14
pyrethrins + canola oil	Earth-tone Insect Control	3/UN	5
pyrethrins + piperonyl butoxide	Bonide Pyrethrin Garden Insect Spray[B]	3	3
pyrethrins + potassium salts of fatty acids (insecticidal soap)	Safer Tomato & Vegetable Insect Killer[O], Safer Yard & Garden Insect Killer[O]	3/UN	5
pyrethrins + sulfur	Bonide Tomato and Vegetable 3 in 1, Natria Insect Disease & Mite Control[B], Ortho Insect Mite & Disease 3 in 1	3/UN	5
oil: canola, neem, rosemary, clove, cottonseed	Natria Multi-Insect Control[OB], Monterey All Natural 3 in 1 Garden Insect Spray	physcial	1
potassium salts of fatty acids (insecticidal soap)	Natria Insecticidal Soap, Safer Insecticidal Soap[OB]	physical	1

*Mode of Action (MoA) is a classification number based on guidelines from the Insecticide Resistance Action Committee. Rotate among insecticide classes to reduce the development of resistance.

[O] Organically certified insecticide products

[B] Biological pesticide

REFERENCES & FURTHER READING

Cannon, C., Bunn, B., Murray, M., Alston, D., Petrizzo, E. (2017). *Aphid pests of vegetables* [Fact sheet]. Utah State University Extension.

Cannon, C., Murray, M., Alston, D., & Drost, D. (2018). *Utah vegetable production and management guide.* Utah State University Extension.

Hall, C. (2014). *Aphid management in winter tunnel greens* [Fact sheet]. Cornell University Cooperative Extension.

Murray, M. (n.d.). *Greenhouse biocontrol in Utah: Beneficial insects and the pests they target.* Utah State University Extension.

Patterson, R., & Ramirez, R. (2016). *Aphid natural enemies and biological control* [Fact sheet]. Utah State University Extension.

Reid, J., & Klotzbach, K. (2014). *Sustainable pest management in greenhouses and high tunnels* [Fact sheet]. Sustainable Agriculture Research & Education.

Stern, D. L. (2008). Aphids. *Current Biology: CB,* 18(12), R504–R505. https://doi.org/10.1016/j.cub.2008.03.034

IMAGE CREDITS

1, 12 Alex Loveland, Utah State University

2 David Cappaert, Bugwood.org

3 Mississippi State University, Bugwood.org

4 Joseph Burger, Bugwood.org

5 Whitney Cranshaw, Colorado State University, Bugwood.org

6 Cami Cannon, Utah State University

7 Whitney Cranshaw, Colorado State University, Bugwood.org

8 Utah State University Extension

9 Alan T. Eaton, University of New Hampshire

10 Nick Volesky, Utah State University

11 u/Radwaymm (https://i.redd.it/0wpr00y8vqry.jpg)

13 u/gameshot911 (https://i.imgur.com/xGxwKy7.jpg)

14 Whitney Cranshaw, Colorado State University, Bugwood.org