

High Tunnel Pest Management - Aphids

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Fig. 1.

Winged Aphids

Thorax darker than abdomen

Thorax green; no abdominal dorsal markings; large (4 mm)

**Potato Aphid***Macrosiphum euphorbiae*

Irregular patch on dorsal abdomen; antennal tubercles swollen; medium to large (> 3 mm)

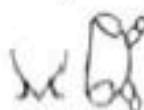
**Green Peach Aphid***Myzus persicae*

No abdominal patch; abdomen light to dark green; small (<2 mm)

**Melon Cotton Aphid***Aphis gossypii***Wingless Aphids**

Cornicles longer than cauda; antennal insertions developed; medium to large (> 3mm)

Cornicles short (same as cauda); head flattened; small (2 mm), rounded body

**Melon Cotton Aphid***Aphis gossypii*

Appendages light; antennal insertions swollen; body pear-shaped

**Green Peach Aphid***Myzus persicae*

Apple green in color; very mobile; antennal insertions diverging; body long (4 mm)

**Potato Aphid***Macrosiphum euphorbiae*



Fig. 2.Clockwise from top left: injury to peach fruit, earwigs inside split pit of peach fruit, injury to new growth of ornamental tree, and injury to a flower. Image courtesy of David Cappaert,



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Fig. 3. Melon aphids. Nymphs can be pale green to bright yellow. Image courtesy of Mississippi State University,



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Fig. 4. Potato aphid. Nymphs and adults can be green-pink in color. Image courtesy of Joseph Burger,



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Fig. 5.Cabbage aphids. Image courtesy of Whitney Cranshaw, Colorado State University,



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Fig. 7. Leaf curl and yellowing caused by aphid feeding. Image courtesy of Whitney Cranshaw, Colorado State University,



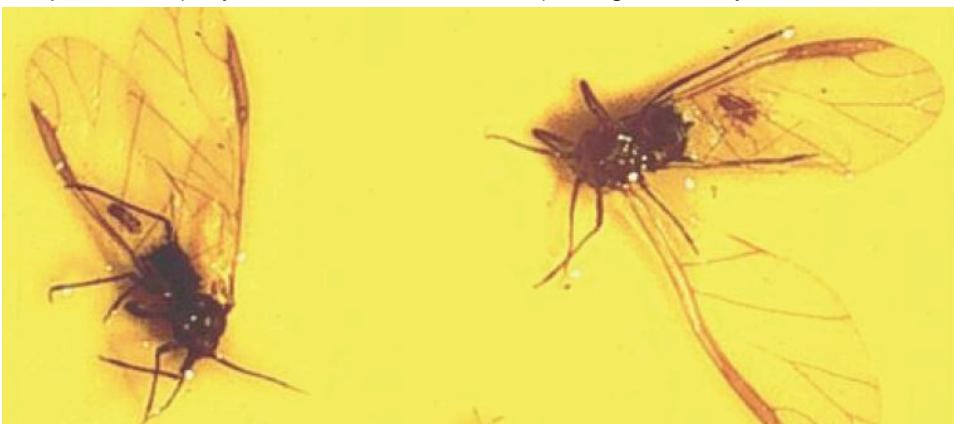
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Fig. 8.Using a hand lens to identify small pests like



aphids

Fig. 9.Casted aphid skins (may be mistaken for whiteflies). Image courtesy of Alan T. Eaton, University of New



Hampshire.

Fig. 10. Winged aphids caught on a yellow sticky



trap

Fig. 11. A sticky trunk band can exclude earwigs. Image courtesy of u/Radwaymm (<https://i.redd.it/0wpr00y8vqry.jpg>).

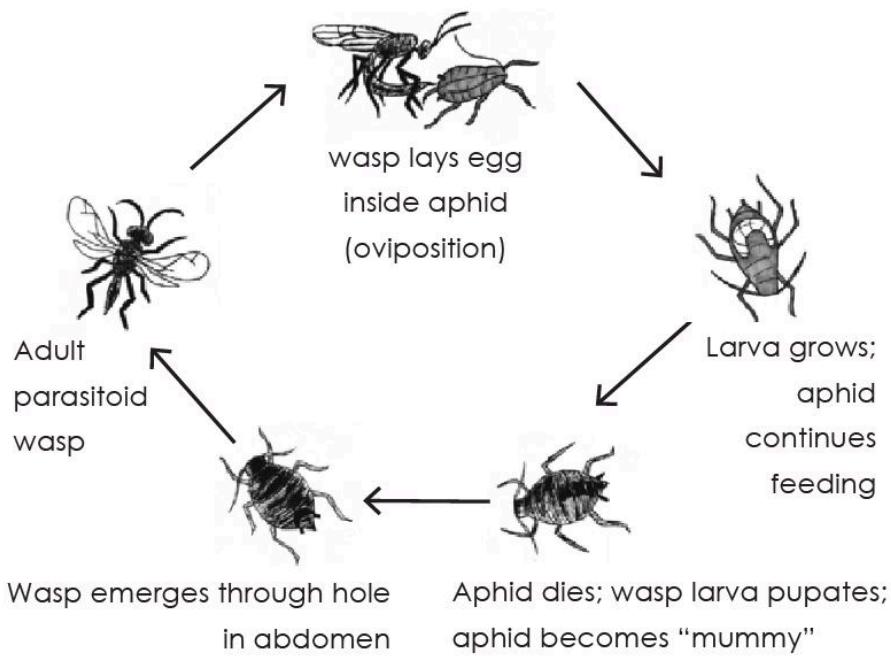


Fig. 12.Life Cycle of Aphid Parasitoid



Wasp

Fig. 13.Damsel bugs feeding on aphid. Image courtesy of u/gameshot911 (<https://i.imgur.com/xGxwKy7.jpg>).



Fig. 14. Aphid killed by infection with *Beauveria bassiana*. Image courtesy of Whitney Cranshaw, Colorado State University, Bugwood.org.



University, Bugwood.org.

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

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 lengthier 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.

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 in (1.5 – 2.3 mm).

High tunnel plant hosts: tomato, pepper, eggplant, squash, cucumber, cabbage, broccoli, and legumes.

Melon aphid

Description: light to dark green or yellow and often pale. Winged adults are often black (Fig. 3). A smaller aphid, reaching up to 0.06 in (1.5 mm) long.

High tunnel plant hosts: cucumber, squash, pepper, eggplant, and other cucurbits.

Potato aphid

Description: pink or green in color (Fig. 4). A larger aphid, measuring 0.07 to 0.16 in (1.8–4.1 mm) long.

High tunnel plant hosts: tomato, eggplant, pepper, pea, and beans.

Cabbage aphid

Description: usually green in color but can often appear gray due to a grayish, waxy covering produced by the insect that is used for protection. This species also has short cornicles (Fig. 5). Individuals can measure from 0.07 to 0.1 in (1.8 to 2.5 mm) long.

High tunnel plant hosts: broccoli, cauliflower, cabbage, kale, collards, kohlrabi, radish, and kale.

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 (*Acyrtosiphon pisum*)

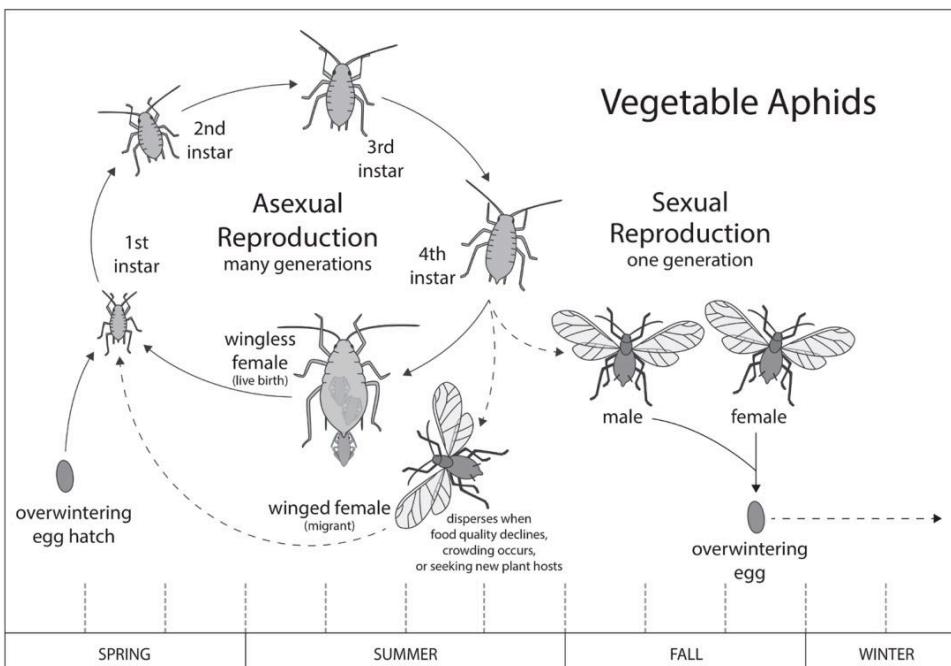
Plum-Thistle aphid(*Brachycaudus cardui*)

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). 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](#).

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.

- **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 shed 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.

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 (Fig. 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).

Table 1. Examples of Aphid Natural Enemies

Common Name	Scientific Name	Family
Convergent Lady Beetle	<i>Hippodamia convergens</i>	Coccinellidae
Seven-spotted Lady Beetle	<i>Coccinella septempunctata</i>	Coccinellidae
Thirteen-spotted Lady Beetle	<i>Hippodamia tredecimpunctata</i>	Coccinellidae
Twice stabbed Lady Beetle	<i>Chilocorus stigma</i>	Coccinellidae
Multi-colored Asian Lady Beetle	<i>Harmonia axyridis</i>	Coccinellidae
Transverse Lady Beetle	<i>Coccinella transversalis</i>	Coccinellidae
Collops Beetle	<i>Collops spp.</i>	Melyridae
Soldier Beetle		Cantharidae

Common Name	Scientific Name	Family
Long-legged Flies		Dolichopodidae
Syrphid Fly		Dolichopodidae
Green Lacewings		Chrysopidae
Brown Lacewings		Hemerobiidae
Dustywings		Dustywings
Red Velvet Mite		Trombidiidae
Banded Thrips		Aeolothripidae
Black Hunter Thrips		Aeolothripidae
Assassin Bug		Reduviidae
Big-Eyed Bug	<i>Geocoris</i> spp.	Geocoridae
Camylomma Bug	<i>Campylomma verbasc</i>	Miridae
Damsel Bug		Nabidae
	<i>Deraecoris brevis</i>	Miridae
Minute Pirate Bug	<i>Orius</i> spp.	Anthocoridae
European Praying Mantis	<i>Mantis religiosa</i>	Mantidae
Chinese Praying Mantis	<i>Tenodera sinensis</i>	Mantidae
Aphid Parasitic Wasps	<i>Aphelinus abdominalis</i>	Aphelinidae
<i>Aphidius colemani</i>	Braconidae	
<i>Aphidius ervi</i>	Braconidae	
<i>Aphidius matricariae</i>	Braconidae	
<i>Aphydoletes aphidimyza</i>	Cecidomyiidae	

For additional biological control information reference the [Aphid Natural Enemies and Biological Control Fact Sheet](#) and [Greenhouse Biocontrol in Utah Guide Book](#).

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.

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. 13). 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.

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 1. Examples of insecticides registered in Utah that are effective 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	physical	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.

^OOrganically certified insecticide products, ^BBiological pesticide. ^{UN}Unknown

References and Further Reading

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