Wingless green peach aphid. Photo by David Cappert, Bugwood.org.

How to manage aphids in season extension structures

Growing season extension (GSE) structures, such as hoop houses, high tunnels, and greenhouses, help many Wyoming gardeners deal with killing frosts in early fall and late spring.

GSE structures can also protect crops from some types of insect pests. For example, I have never had any questions about grasshopper damage inside a high tunnel or hoop house. However, these enclosed environments do create favorable conditions for aphid infestations.

Aphids are small, soft-bodied, plant-feeding insects that can reproduce rapidly, making them a formidable pest in GSE structures. All aphids feed on plant sap with a short piercing and sucking beak that is held next to their body when not in use. Aphid feeding can stunt plant growth, deform leaves, and transmit plant diseases. Additionally, as they feed, aphids produce honeydew, a sugary substance that can promote the growth of sooty mold and attract other pests, such as ants.

However, with a proactive approach and integrated pest management (IPM) strategies, growers using GSE structures can effectively control aphid populations and protect their crops.

Aphid life cycles in GSE structures

If you understand the life cycle of the pest species you are dealing with, you can use that knowledge to manage them effectively. For example, life cycle disruption is an effective management strategy used to control the green peach aphid (*Myzus persicae*), a common GSE structure pest.

To survive winter temperatures in the wild, green peach aphid oviparae (special females able to produce winter-hardy eggs) must attach freeze-resistant eggs to the overwintering buds on stone fruit trees. In Wyoming, various cherries, plums, and chokecherries are suitable winter hosts for this species.

In a GSE structure, green peach aphids can ignore the changing season. Rather than producing a winged sexual generation of oviparae, the female aphids just continue to give birth to nymphs, avoiding the need for winter-hardy eggs. If you can open and expose the interior of your GSE structure to freezing temperatures for at least a few days, you can wipe out the cold-sensitive adults and nymphs and start your next growing season without them.

Other species, such as cabbage aphids (*Brevicoryne brassicae*), will produce eggs in response to shorter fall days in cold climates. Their oviparae females will place eggs around any plants or crop residue from the mustard family (Brassicaceae) inside a GSE structure. However, if grow lights are used to lengthen the "days," evidence suggests that this species may not produce a sexual generation at all.

A freezing cold treatment of a GSE structure would kill the adults and nymphs of cabbage aphids, but their eggs can survive freezing cold. To successfully eliminate this pest, you must combine a "freeze out" treatment with a clean out of all plant debris to ensure eggs are eliminated as well.

Integrated pest management for aphid infestations

Integrated pest management (IPM) emphasizes the use of multiple tactics to manage pests while minimizing environmental impact and preserving beneficial organisms. Below is a list of strategies suitable for use in aphid-infested GSE structures.

- **Pest exclusion**: Prevent aphids from entering GSE structures by using fine mesh screens on vents and entrances. In the published literature, 0.434 millimeters is the recommended maximum mesh opening size to prevent green peach aphids from entering a greenhouse. Other species of aphids and pests may require smaller mesh openings. Visit https://bit.ly/insect-exclusion to learn more. Maintaining adequate air circulation when using small mesh screens on GSE structures can be a challenge. For suggestions on how to do this effectively, check out https://bit.ly/uf-ifas-screens, a video produced by the University of Florida's Institute of Food and Agricultural Sciences.

- **Scouting and monitoring**: Aphid populations can increase extremely quickly, so regular scouting is crucial for early detection of infestations. Make sure to thoroughly inspect both sides of leaves for aphids of all life stages. To monitor for winged adults coming in or moving to new plants, place yellow sticky traps strategically throughout the GSE structure.

- **Cultural controls**: Cultural practices that discourage aphid infestations include using proper spacing between plants to improve air circulation, removing weeds that may serve as alternate hosts for aphids, and maintaining optimal plant health through appropriate watering and fertilization. You can also disrupt the aphids' life cycle when crops are not actively growing in your GSE structure. Aphids can be eliminated by freezing and/or physical removal of all potential host plants, destroying the "green bridge" that allows them to survive from one season to the next. This tactic is particularly effective for managing aphid species that do not produce freeze-resistant eggs indoors.

- **Biological control**: If aphid populations are already present, you can introduce commercially available natural enemies of aphids, such as

The wingless forms of these cabbage aphids exhibit the white waxy dust coating that is characteristic of the species. Photo by Alton N. Sparks, Jr., University of Georgia, Bugwood.org.

ladybugs, lacewings, and aphid parasitic wasps, to GSE structures. These beneficial insects do not eliminate aphids but can help keep their populations at tolerable levels. However, note that these natural enemies may not stick around if pest levels drop too low and they have a way to exit the structure.

- **Mechanical control**: Use a strong stream of water to dislodge aphids from plants. Remove heavily infested plants or leaves and dispose of them in bagged trash to eliminate any chance of reinfestation.

- **"Soft" insecticide control**: Use insecticidal soap solutions, horticultural oil solutions, botanical insecticides, or insect pathogen products such as *Beauveria bassiana*. Make sure these products are labeled for both aphids and the crop you are trying to protect. Apply these products precisely to minimize harm to beneficial insects and your plants, and follow all label instructions.

- **Synthetic insecticide control**: In some situations, synthetic insecticides can be used to control aphid pests inside GSE structures. Chemical control may be a viable option if there are no biological control species present that could be adversely affected by broad-spectrum insecticides. However, be aware that many aphid species have populations that are resistant to organophosphates, carbamates, pyrethroids (including the organic pyrethrums), neonicotinoids, and multiple insect growth regulators mode of action products.

By adopting an integrated approach to aphid management in GSE structures, growers can effectively control pest populations while minimizing reliance on chemical pesticides. Regular monitoring, cultural practices, biological controls, and targeted use of insecticides when necessary can help maintain a healthy and productive growing environment. With careful attention and proactive pest management, growers can enjoy successful harvests in their GSE structures year-round.

Entomologist **Scott Schell** is UW Extension's insect expert. Contact him at sschell@uwyo.edu or (307) 766-2508 with questions about aphids and other pesky bugs.

Wingless potato aphid. Photo by Joseph Berger, Bugwood.org.

Common aphid species found in GSE structures

Understanding the characteristics and life cycles of these common aphid species can help growers implement targeted management strategies in GSE structures. For more information on managing aphids and other pests, visit https://bit.ly/bug-toolbox.

Green peach aphid (*Myzus persicae*)

Host plants: They infest a wide range of crops, including peaches, potatoes, tomatoes, peppers, and even alliums such as onion and garlic.

Damage: Green peach aphids feed on plant sap, causing leaf curling and stunted growth. They can spread many plant viruses.

Life cycle: They reproduce rapidly; during an infestation, both winged and wingless forms may be present at the same time. Outdoors, they can overwinter as eggs on the buds of multiple stone fruit trees and shrubs. Inside GSE structures, they can reproduce asexually continually.

Potato aphid (*Macrosiphum euphorbiae*)

Host plants: They primarily infest plants in the nightshade family, including potatoes, tomatoes, tomatillos, peppers, and eggplants.

Damage: Potato aphids can cause leaf curling, yellowing, and distortion, leading to reduced plant vigor and yield. In addition, they can transmit several plant diseases.

Life cycle: Potato aphids reproduce asexually under favorable conditions, with winged forms only appearing when populations become overcrowded. Outdoors, they overwinter as eggs on or near plant species that the nymphs can feed on in the spring. Indoors, they reproduce asexually continually.

Cabbage aphid (*Brevicoryne brassicae*)

Host plants: They primarily infest plants in the brassica family, including cabbage, broccoli, cauliflower, and kale. They do not feed on or utilize plants other than brassicas for a winter host.

Damage: Cabbage aphids feed on plant sap, causing stunted growth, yellowing, and distortion of leaves, which leads to reduced quality and yield. They are also capable of transmitting turnip mosaic and cabbage leaf curl viruses.

Life cycle: They reproduce rapidly and both winged and wingless forms can be present in an infestation. Cabbage aphids can overwinter either as eggs on host plants, or as asexually reproducing adults in mild climates or GSE structures.