Natural Enemies of Two-Spotted Spider Mite and Hop Aphid on Hop

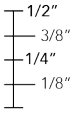
"A complex of natural enemies over time can enable biological control to play a larger role in pest suppression"

Commercial hop production is plagued by multiple pests, two of the most important being the two-spotted spider mite and hop aphid. The economic impact of chemically controlling these pests is significant and resistance issues provide further impetus to seek out other control options.

Pest suppression, particularly of two-spotted spider mite, through biological control can be achieved with careful management practices in certain regions and hop varieties.

The purpose of this bulletin is to highlight the major predators and predator groups that regulate populations of these pests and provide growers with a practical guide to their identification.

Scale



- Mite Eating Lady Beetle
- Minute Pirate Bug
- Predatory Mite

Deraeocoris brevis

Lady Beetle

Damsel Bug

Lady Beetles

- Adults are ¼ inch and are typically red/orange with black markings. Larvae are alligator-shaped and range from purple/blue to dark gray with orange-yellow markings. Lady beetle eggs are light orange, rocket-shaped and are laid in clusters.
- Lady beetle adults and larvae are voracious feeders and can eat as many as 100 aphids per day.

Lady Beetle Adult

Lady Beetle Larvae

Predatory Mites

Predatory Mite

- Multiple species may occur, with *Galendromus occidentalis* and *Neoseiulus fallacis* the most common
- Pale tan/yellow, pear-shaped, shiny, and fast moving
- Adults are approximately the same size as a spider mite
- Eggs are oval shaped and translucent; similar in size to spider mite eggs
- Can eat 3-10 spider mites and/or eggs per day, depending on temperature
- Reproduce quickly and can provide suppression of spider mites
- Tend to be most numerous at plant emergence and mid-late in the season
- Predatory mites are sensitive to disturbance, especially pesticides, and careful attention to factors that harm predatory mites is needed

Predatory Bugs

Damsel Bug

Deraeocoris brevis

- Complex of species that feed on more than one type of prey, e.g., spider mites, aphids, hop loopers, thrips, and others.
- **Minute pirate bugs** are tiny (1/12-1/5 inch) and black with white markings on forewings. Nymphs are orange-brown and are tear-drop shaped. Adults and nymphs can eat up to 40 spider mites per day.
- ***Deraeocoris brevis*** are small (1/10-1/5 inch) and shiny black with pale/clear wing markings. Nymphs are mottled gray with hairs on the body. Adults can eat 10-20 spider mites or aphids per day and nymphs can eat up to 400 mite eggs per day.
- **Nabidae (damsel bugs)** are small (up to ½ inch long), slender, and are tan to light brown with an elongated head and long antennae. Nabids are known to feed on spider mites, aphids, thrips, loopers, and other insects. Can eat 3-10 spider mites and/or eggs per day, depending on temperature.
- Predatory bugs tend to be most prevalent in hop yards in late spring and summer.

Minute Pirate Bug

Mite-Eating Lady Beetles

Stethorus Adult

Stethorus Larvae

- Two species of *Stethorus*
- Adults are tiny (1/25-1/16 inch) oval black beetles
- Larvae are black to dark gray and are similar in length to adults
- Eggs are white/cream, oval, and are about 3x the size of a spider mite egg
- Adults and larvae are voracious eaters, consuming up to 75 eggs per day
- Tend to be present in hop yards throughout the growing season, beginning in mid spring.
- Early colonization of hop yards can mitigate mite outbreaks

Other Natural Enemies

Other generalist predators that are commonly found in hop yards include rove beetles, *Heterotoma* spp., Anystid mites, parasitic and predatory flies, parasitic wasps, predatory midges, predatory thrips, and lacewing adults and larvae. These organisms, along with those described above, all appear to contribute to pest regulation at some level, particularly for two-spotted spider mite. Establishment of a complex of natural enemies over time can enable biological control to play a larger role in pest suppression. The most stable and resilient biological control of spider mites appears to function when a complex of all of the predators are present.

For Further Reading

- Field Guide for Pest Management in Hops: https://www.usahops.org/resources/field-guide.html
- Pacific Northwest Insect Management Handbook: https://pnwhandbooks.org/insect/ipm/biological-control

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