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Large Raspberry Aphid
Amphorophora agathonica

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The large raspberry aphid, *Amphorophora agathonica*, is native to North America. It can be found throughout the northern United States and Canada on cultivated red raspberry and black raspberry, and on a variety of native *Rubus* species such as thimbleberry and salmonberry. It is not known to colonize commercial blackberries.

Large raspberry aphid is notable as a vector of viruses in *Rubus*, including **Raspberry leaf mottle virus** (RLMV, semi-persistent) and **Raspberry latent virus** (RpLV, persistent) in red raspberry, and **Black raspberry necrosis virus** (BRNV, non-persistent) in black raspberry. These viruses are to blame for decreased cane vigor and field decline requiring frequent replanting, as well as crumbling fruit symptoms in red raspberry.

Figure 1. Adult large raspberry aphid, *Amphorophora agathonica*.

Description

The large raspberry aphid is 2.5 to 4.5 mm in length. Color ranges in individuals from light to dark green. They have very long antennae and legs (Figure 1), and will readily walk away or drop from leaves if disturbed. The cornicles (tubes on the aphid's back) are green, approximately 0.7 mm long, and swollen near the end. Winged forms may be darker on the thorax where the wings attach, but they have the long legs and antennae characteristic of this species. Ants are not typically associated with *A. agathonica*.

Large raspberry aphid can be distinguished from the small raspberry aphid (*Aphis rubicola*) by body size. *Aphis rubicola* is 1.5 to 2 mm long and does not have the long legs and antennae characteristic of *A. agathonica*. *A. rubicola* is relatively uncommon on the west coast of North America.

The closely related *Amphorophora rubitoxica* is frequently found in black raspberry fields in the Pacific Northwest. *A. agathonica* and *A. rubitoxica* are very similar in appearance, but they can be distinguished by the damage they cause. *A. rubitoxica* causes leaf spotting and is not known to be a virus vector.

Damage

Feeding damage (leaf damage or cane stunting) is typically not observed from *A. agathonica*. However, control of this aphid is important because it transmits several viruses (in the Pacific Northwest: RLMV and RpLV in red raspberry and BRNV in black raspberry) that are responsible for declines in cane vigor and decreased fruit quality.

Non-persistent viruses are acquired after short feedings (minutes) and transmitted for only minutes.

Semi-persistent viruses can be acquired after short feedings (minutes to hours) and transmitted for several days.

Persistent viruses are acquired after sustained feeding periods and can be transmitted for the remainder of the aphid's life.

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Life cycle

Large raspberry aphids overwinter as shiny black eggs laid at the base of *Rubus* canes or the undersides of leaves before they fall to the ground. Time of aphid hatch varies regionally but is closely synchronized with cane bud break.

Aphids go through several parthenogenic (asexual) generations before developing wings. Winged forms (alates) can migrate among fields and over long distances. Alates are produced from June through September, with peak flights noted in late June and late August. In late September and October, sexual aphid forms are produced and lay the eggs that survive the winter (Figure 2).

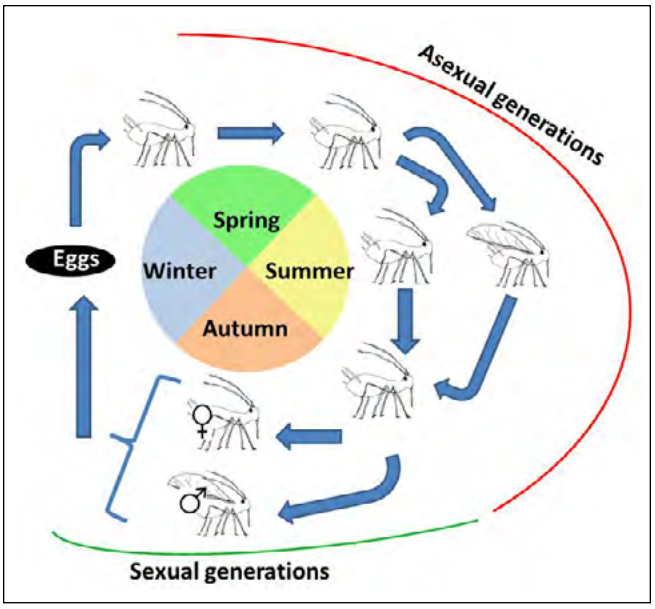

Diagram by Danielle Lightle, © Oregon State University

Figure 2. Annual life cycle of large raspberry aphid.

Monitoring

Visual inspection

Monitor for non-winged forms by inspecting *Rubus* fields (Figure 3). Examine canes for the presence of aphids at the tips and undersides of newly expanded leaves where the plant tissue is most tender. Another method is to shake the cane or trellis wire to dislodge the aphids onto a white cloth. Aphids are often distributed in patches throughout the field, and are just as likely to be found in the middle of the field as on the edges. Aphids may be found on both primocanes and floricanes, especially early in the season; but they tend to prefer colonizing primocanes after fruit has been harvested.

Alate aphids and peak flight may be monitored using yellow water traps (a pan or bowl painted yellow and filled with soapy water). However, because this method attracts many other aphid species that are also migrating, water traps are not recommended for scouting unless you have a microscope available to identify the different species.

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Figure 3. Adult (larger, green; near top) and nymphs (smaller, light green) of the large raspberry aphid.

Action thresholds

No thresholds have been determined for this species.

Preventive and control methods

Biological control

Many effective natural enemies are found in caneberry systems (Figure 4, page 3). These include the parasitoid *Aphidius* spp., ladybeetles, lacewings, and fungal pathogens. Note that natural enemies may contribute to reducing aphid numbers, but they are probably not an effective management strategy to control virus spread.

Cultural control

Overwintering aphid eggs are frequently laid on the undersides of leaves. Where practical, burying, removing, or destroying fallen leaves during the winter may decrease the number of colonizing aphids in the early spring.

Resistant cultivars

Many red raspberry cultivars have been released that contain an aphid-resistant gene known as Ag_1. These plants prevent colonization of aphids, so aphid numbers and virus spread are greatly limited. Resistance-breaking biotypes of large raspberry aphid are reported in British Columbia, but they do not appear to be widespread at this time. Ask your local Extension office for resistant red raspberry cultivar recommendations. There are currently few options for aphid-resistant black raspberry cultivars.

Figure 4. Some natural enemies of large raspberry aphid. Clockwise, from top left: green lacewing (photo: Stephen Ausmus, USDA-ARS); aphid mummy, parasitized by *Aphidius* (photo: Sarefo, used by permission); Asian lady beetle (photo: Scott Bauer, USDA-ARS).

Chemical control

Systemic insecticides may provide long-lasting control of aphids while also limiting the spread of the most common *Rubus* viruses. Virus spread among fields occurs during peak flights, so control is especially important during these times. For current recommendations, consult the *Pacific Northwest Insect Management Handbook* (http://uspest.org/pnw/insects) or contact your local Extension office. Always follow label limitations, especially during bloom, because of potential toxicity to bees.

Planting material

Regardless of the cultivar you choose to plant, it is important to select certified planting stock that you can expect to be free of known viruses. Virus-infected stock has lower vigor compared to healthy plants, especially in the first 1 to 3 years after planting. Infected plants also provide an inoculum source that may lead to greater virus spread throughout the planting.

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