Integrated Pest Management
Pest Profiles
University of Idaho Extension Bulletin 1047

Integrated Pest Management of Aphids in Cereals

Pest Common Name (Scientific Name)

Bird Cherry-Oat Aphid (*Rhopalosiphum padi*)

Corn Leaf Aphid (*Rhopalosiphum maidis*)

English Grain Aphid (*Sitobion avenae*)

Cereal Grass Aphid (*Metopolophium festucae cerealium*)

Rose-Grain Aphid (*Metopolophium dirhodum*)

Greenbug (*Schizaphis graminum*)

Russian Wheat Aphid (*Diuraphis noxia*)

Host Plants

- Grains: All major cereals, including barley, wheat, and oats; Russian wheat aphid is usually only found on barley and wheat
- Other crops: Most species can also be found on corn and pasture grasses
- Noncrops: Most species can be found on a variety of grasses and occasionally woody plants

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Description

In general, aphids are small, 1/32–1/8 inches (0.8—3.2 millimeters) and are plant-feeding insects with soft bodies. They are usually oval- to pear-shaped and may be green, black, yellow, or reddish in color. While immature aphids are always wingless, wings may be present or absent in adults (Figure 1). One of the best ways to distinguish aphids from other arthropods is the presence of *cornicles* (also called *siphunculi*), which are paired, rear-facing "tailpipe"-like structures situated toward the back of their body. However, note that in some species, including the Russian wheat aphid, the cornicles are very small.

Figure 1. Adult bird cherry-oat aphids: wingless (left) and winged (right). Courtesy of Erik Wenninger, University of Idaho.

Not every aphid found on a cereal crop is necessarily colonizing (living and reproducing on) the crop or even feeding on it. Some aphids may just be "passing through" as they search for their desired host plants. Colonizing and noncolonizing aphids can largely be distinguished from one another by the presence or absence of wings. Colonizing species usually form clusters of wingless immature and adult aphids on the cereal crop, while noncolonizing species are usually sparse and winged (Figure 2).

Figure 2. Typical Russian wheat aphid (*Diuraphis noxia*) (left) and greenbug (*Schizaphis graminum*) (right) colonies. Note the clustering behavior and different sizes of wingless individuals. Courtesy of Frank Peairs, Colorado State University, bugwood.org (left) and Kansas Department of Agriculture, bugwood.org (right).

Figure 3. Russian wheat aphid (*Diuraphis noxia*), showing highly reduced cornicles (left), and slide mount of an English grain aphid (*Sitobion avenae*) (right), showing prominent cornicles. Frank Peairs, Colorado State University, bugwood.org (left) and Brendan Wray, AphidID, USDA APHIS PPQ, bugwood.org (right).

There are several species of aphids that colonize cereal crops in Idaho. Multiple species often co-occur in the same field, making differentiating between these species in the field difficult. One exception is the Russian wheat aphid, which is more easily identified by its lack of conspicuous cornicles ("tailpipes" toward the back of the body) (Figure 3), in contrast to the much longer, easily noticeable cornicles found in other cereal-colonizing species. A hand lens or microscope may be necessary for accurate species-level identification. Correct identification of aphid species can be important for making optimal management choices. More information and identification resources for cereal colonizing aphids can be found in Adhikari et al. 2022 or Hein et al. 2005. Because species-level identification can be extremely challenging, consult local university Extension personnel as often as possible.

Biology

Aphids feed by piercing plants with needle-like mouthparts and sucking out nutrient-rich sap. Most cereal-colonizing aphids feed on a diverse array of grasses and grasslike plants, such as sedges, rushes, and cattails. Depending on the species, aphids may use a single host plant species year-round or use different hosts during different seasons. Aphid species that use different hosts depending on the season (a strategy called *host alternation*) usually use a woody host plant during the winter and a cereal or grass during the summer. Examples of host-alternating aphids include the rose-grain aphid and bird cherry-oat aphid, which use roses and chokecherry (*Prunus virginiana*) or bird cherry (*Prunus padus*) as winter hosts, respectively, while colonizing cereal crops and grasses in the summer. The other cereal-colonizing aphids listed above do not alternate host plants and spend their entire lives on cereals and/or other grasses.

During most of the year, aphids exclusively undergo asexual reproduction — females give birth to clones of themselves without mating — a strategy that allows for rapid population growth. Sexual reproduction occurs only on winter hosts (in the case of host-alternating species), during certain times of the year, or under specific environmental conditions (in the case of single-host species).

Cereal-colonizing aphids generally overwinter as eggs laid on or near a suitable host plant. Female aphids known as *fundatrices* (singular *fundatrix*) hatch from the eggs and give birth to new colonies in spring. Aphids may move to cereal crops from other host plants at any point during the growing season, with late summer and fall often being the most problematic times for aphid migrations.

Damage

The characteristics and severity of damage vary by species of aphid and an infestation's intensity. Damage induced by cereal-colonizing aphids can be

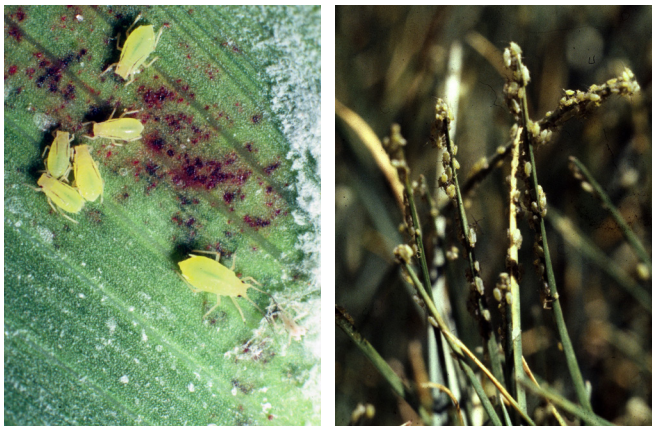

Figure 4. Damage on grasses caused by greenbug (*Schizaphis graminum*). Notice the characteristic reddish patches of discolorations on sorghum (left) and yellowing/dead leaves on bluegrass (right). Courtesy of Alton N. Sparks Jr., University of Georgia, bugwood.org (left) and Whitney Cranshaw, Colorado State University, bugwood.org (right).

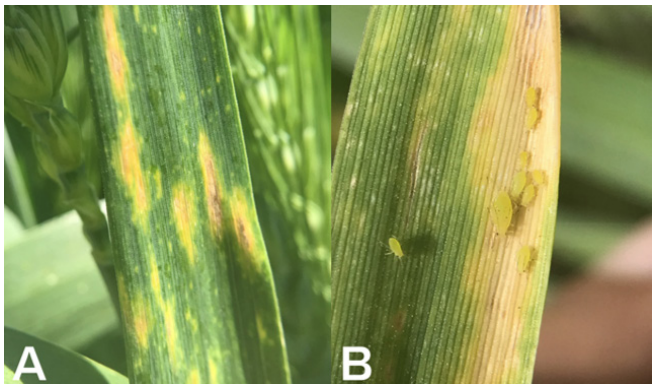

Figure 5. Damage on wheat caused by cereal grass aphid (*Metopolophium festucae cerealium*), showing spots caused by feeding damage (**A**) and a small colony of nymphs and adults feeding on a patch of chlorotic tissue (**B**). Courtesy of Brad Stokes, University of Idaho.

Figure 6. Damage on wheat caused by Russian wheat aphid (*Diuraphis noxia*), showing rows of yellowed plants showing symptoms similar to drought damage. Courtesy of Phil Sloderbeck, Kansas State University, bugwood.org.

broken down into two types: physical effects caused by the feeding activity of the aphids and transmission of plant-pathogenic viruses.

In terms of physical effects, heavy infestations of aphids may cause a decrease in nutrient levels within the afflicted cereal crop (e.g., decreases in protein content), reduction in yield, leaf necrosis (death), and leaf discoloration. The pattern and progression of leaf discoloration may provide some insight into the species responsible for the damage. Greenbug aphids cause discoloration of leaves, starting with small, reddish spots in spring which expand into yellow or red patches, potentially causing leaf death, and spread widely throughout the field (Figure 4). Cereal grass aphids induce leaf yellowing and death (Figure 5). Feeding of the Russian wheat aphid causes discoloration that starts as white, yellow, or purple streaks and progresses into yellowing that resembles the effects of drought-stress (Figure 6). Russian wheat aphid feeding also causes leaves to curl tightly around the aphid colony, creating a space that shelters the aphids. Additionally, seed heads and/or flag leaves may twist and curl, potentially preventing proper emergence and reducing yield. Heavy infestations of Russian wheat aphid may stunt growth and cause losses of entire fields if the infestation is not detected and controlled early.

The rose-grain aphid, English grain aphid, and corn leaf aphid do not usually cause noticeable physical damage. The bird cherry-oat aphid also typically does not cause physical damage and rarely induce curling of the flag leaf in a manner that traps the awns, giving a "fish-hook" appearance. Occasionally leaf yellowing will also be evident.

The other, often more serious, form of damage inflicted by aphids is the spread of plant-pathogenic viral diseases. While there are several viruses that may be vectored to cereals by aphids, *Barley yellow dwarf virus* (BYDV) is the most significant in Idaho. Of the cereal-colonizing aphids listed at the beginning of the profile, all except the Russian wheat aphid are potential vectors of BYDV. Of the BYDV vectors, the bird cherry-oat aphid and the English grain aphid are generally considered to be the most significant in Idaho. Other aphid species are inefficient or minor vectors. BYDV affects many crops in the grass family, including barley, wheat, and oats. Though symptoms of the virus

can vary, the most common are stunting of leaves, roots, and seed heads and a yellow and/or reddish discoloration of the leaf tips that slowly spreads down the leaves as the infection progresses (Figure 7). While BYDV can impact either winter or spring cereal crops, it is a larger concern for winter crops planted in the fall. On average, BYDV causes yield reductions between 10% and 20% in infected fields, though losses as high as 70%–100% have been reported when infection occurs early after plant emergence. For more information, see Marshall and Rashed 2014.

Figure 7. Symptoms of *Barley yellow dwarf virus*. Reddish and yellowish leaf discoloration on wheat (left); field showing several oat plants suffering from characteristic BYDV yellowing (right). Courtesy of Brian Olson, Oklahoma State University, bugwood.org.

Monitoring

Suction traps are widely used to monitor the movement of flying insects, including aphids. Typically, these traps consist of an open-topped vertical tube, at least 6 feet (2 meters) in height, with a fan pulling air through the tube. Flying insects are pulled into a collection container, which usually contains a mixture of ethanol and propylene glycol. The traps monitor aphid movement, more than aphid populations in a particular field, and are often maintained in networks by governmental agencies or universities. For University of Idaho's aphid-monitoring data, visit the Idaho Pest Monitoring site.

Scout regularly to detect the presence of aphids in specific fields throughout the growing season. Inspect several areas of the field, not just along the margins, for aphids and their damage. Using a sweep net to sample zigzag transects in the field can be helpful. When scouting for aphids and their damage, inspect tillers, both sides of leaves (Figures 4–6), and rolled leaves, which may contain colonies. It is important to document the number of plants scouted, the number of aphids per plant, and the percentage of the plant damaged each time you scout, because it allows you to track trends, calculate averages, and make informed management decisions. In general, specific economic thresholds are not set for most aphids in Idaho. However, there are some general recommendations for major cereal-colonizing species (see Tables 1 and 2).

Bird cherry-oat aphid and English grain aphid cause damage primarily through virus-vectoring BYDV, so scout for symptoms of the virus (Figure 7) and consider treatment if you detect BYDV.

Table 1. Suggested economic thresholds for treatment of Russian wheat aphid and cereal grass aphid.

Crop	Stage	Season	Threshold
Winter grain	Seedlings (1 Tiller)	Fall	10% of plants infested
Winter grain	Plants with >1 tiller	Fall	Plants are stressed or if there is a threat of winter kill in the area
Winter grain	Green-up to first node's appearance	Spring	5% of plants infested and freshly damaged
Winter grain	Appearance of first node to head emergence	Spring	10% of tillers infested
Spring grain	Emergence to head emergence	Spring	10% of tillers infested
Spring grain	Head emergence to soft dough	Spring	Heavy infestation (more than 20 aphids per plant) on 10%-20% of flag leaves/stems
Spring grain	After soft-dough stage	Spring and Summer	Little to no benefit of insecticides

Table 2. Suggested economic thresholds for greenbug aphids.

Crop Stage	Threshold
Seedling	Average of 5–15 aphids or more on tiller/stem
Boot	Average of 10–25 aphids or more on tiller/stem

Rose-grain aphids and corn leaf aphids are generally not very significant problems in Idaho and tend to cause economic damage only in years or locations where conditions are favorable for outbreaks. In these situations, follow the guidelines for scouting other aphids with similar life cycles and damage levels like these species.

While scouting for aphids, also look for beneficial insects such as ladybugs, lacewings, syrphid fly larvae, and aphid "mummies" (Figure 8), which are a sign of parasitoids at work. Also keep an eye out for aphids that have been killed by disease or fungi. These aphids may appear bloated, off-color, flattened to the leaf surface, or fuzzy. The presence of predators, parasitoids, disease, or beneficial fungi may be sufficient to reduce aphid numbers significantly within a few days, mitigating the need for other control measures.

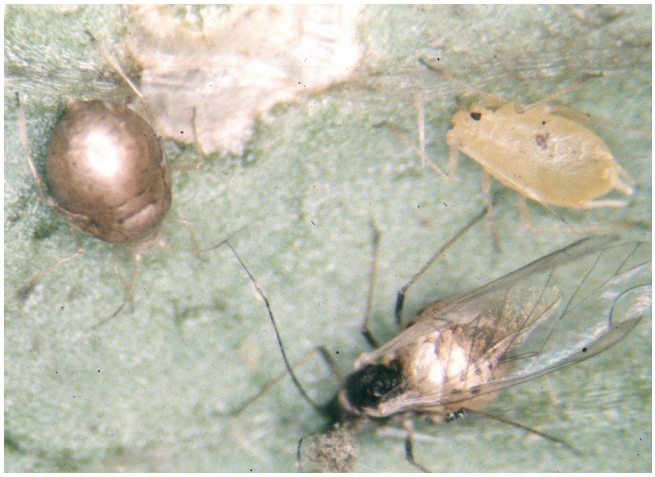

Figure 8. Aphid "mummies," winged and wingless form, that have been attacked by parasitoid. Courtesy of Whitney Cranshaw, Colorado State University, bugwood.org.

Management

Primary Management Tactics

Aphids are normally held in check in cereals by natural enemies such as predators and parasitoids. If populations exceed economic thresholds or monitoring and forecasting suggests there is a high risk of BYDV spread, insecticidal treatments may be advised.

Biological

- Avoid the use of broad-spectrum insecticides, when possible, to conserve natural enemies of aphids (predators, small parasitoid species) that generally keep aphid populations below economic thresholds.
    - Scout fields for the presence of "aphid mummies" (the husklike remains of parasitized aphids) (Figure 8) and key predators, such as ladybugs and hoverflies, before making management decisions.
- Use caution before applying foliar fungicide since it may eliminate beneficial fungi that help keep aphid populations in check.

Cultural

- Follow recommendations for planting dates in your area.
    - Optimize planting times to avoid peak flight times of aphids.
    - Avoid planting early in the fall to avoid peak BYDV transmitting aphid flights and to reduce the window of feeding time.
- Plant varieties of grain that are resistant to the Russian wheat aphid to help reduce damage from this species.

Physical

- Eliminate potential reservoirs of BYDV, such as grassy weeds (e.g., crabgrass), near cereal fields.
- Manage aphids in nearby grassy crops (e.g., corn).

Chemical

- Insecticidal seed treatments can be effective in preventing the spread of BYDV in wheat and barley early in the season.
- Foliar insecticide applications may be used in the cases of severe infestation.
    - Foliar insecticide applications done after the milk-ripening stage are of no value in cereals.
    - For those aphids that hide within rolled leaves, such as the Russian wheat aphid, foliar insecticides are far more effective when applied before leaf rolling occurs.
- Specific recommendations for pesticides to use to manage aphids can be found in the Pacific Northwest Pest Management Handbooks (see "Small Grain-Russian Wheat Aphid" and, for the rest, see "Small Grain-Aphid").

Further Reading

Adhikari, S., E. C. Oeller, A. Rashed, S. D. Eigenbrode, and B. Stokes. 2022. *Cereal Grass Aphid: A Newly Invasive Pest in North America*. University of Idaho Extension Bulletin 1026. 4 p.

Hein, G. L., J. A. Kalisch, and J. Thomas. 2005. "Cereal Aphids." *NebGuide*. University of Nebraska–Lincoln Extension G1284. 4 p.

Marshall, J. M., and and A. Rashed. 2014. *Barley Yellow Dwarf Virus in Idaho Cereal Crops*. University of Idaho Extension CIS 1210. 4 p.

Caution: Read Pesticide Labels

Pesticide labels override other recommendations.

ALWAYS read and follow the instructions printed on the pesticide label. The pesticide recommendations in this UI webpage do not substitute for instructions on the label. Pesticide laws and labels change frequently and may have changed since this publication was written. Some pesticides may have been withdrawn or had certain uses prohibited. Use pesticides with care. Do not use a pesticide unless the specific plant, animal, or other application site is specifically listed on the label. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

Trade Names — To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

Groundwater — To protect groundwater, when there is a choice of pesticides, the applicator should use the product least likely to leach.

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