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# Cereal Grass Aphid

## *A Newly Invasive Pest in North America*

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## Introduction

CEREAL GRASS APHID (*Metopolophium festucae* subspecies *cerealium* Stroyan (Hemiptera: Aphididae) is a newly invasive aphid pest in North America that colonizes cultivated crops such as wheat, barley, and oat. The first reported fescue aphid (subspecies not specified) in North America was discovered in California in 1970, but it wasn't until 2011 that researchers noted the appearance of a cereal grass aphid in the Pacific Northwest (PNW) region of the United States (Halbert et al. 2013). It is a subspecies of the fescue aphid or grass aphid (*M. festucae*), found mainly on grass hosts in its native range in western Europe. Preliminary surveys of commercial fields performed in the PNW suggest that cereal grass aphid can become abundant in its invasive range and cause considerable damage to wheat, barley, and oat.

## Identification and Biology

Cereal grass aphid has both winged and wingless forms (Figure 1). The wingless form is shiny, yellowish, or pale green (Figures 1 and 2); it has lightly colored cauda (short, tail-like appendage) and siphunculi (a pair of posterior abdominal tubes), with elongated legs and antennae whose coloring gradually darkens from trunk to tip (Figure 2). The winged form of the aphid possesses dark bands across the abdomen (Figures 1B and 3). The damage cereal grass aphids cause is unique and easily observed as red-pigmented spots or lesions that fuse into chlorotic and necrotic patches (Figure 4), which helps to identify this aphid on wild and cultivated hosts such as bluebunch wheatgrass, blue wild rye, meadow foxtail, perennial bunchgrass, barley, and wheat.

Cereal grass aphid frequently co-occurs in wheat systems with rose-grass aphid (*M. dirhodum*), a related and visually similar aphid (Figure 5). Under a hand lens, dark antennal joints can be seen in wingless rose-grass aphids (Figure 5B), while cereal grass aphids have antennae that progressively darken from


**Figure 1.** Cereal grass aphids. **A:** A colony of winged and wingless aphids on a wheat leaf. **B:** One mature wingless individual and two winged females. Photo A courtesy of Taylor Murphy, University of Idaho.

base to tip (Figure 5A). The winged form of rose-grass aphid lacks horizontal bands on the abdomen (Figure 6) (compare with Figure 3). Additionally, rose-grass aphid feeding does not produce pigmented chlorotic and necrotic patches on leaves.

Most aphid species have both sexual and asexual reproductive phases. The sexual phase, during which eggs are produced, usually occurs on a perennial host (e.g., trees and shrubs), a setting that enables aphid eggs to survive relatively harsh winter conditions. The asexual phase occurs during the summer. During the asexual phase, the female produces live aphids that are genetically identical to one another and to her (i.e., clones). Unlike rose-grass aphid that also feeds on roses (perennial host), cereal grass aphid has only been found feeding on wild and cultivated grasses.

## Hosts and Geographic Ranges

Cereal grass aphid is an invasive pest of wheat and other small grains reported in New Zealand, Argentina, Bolivia, Chile, and the PNW region of the United States. Since it was first identified in 2011 on wheat and perennial grasses of the inland PNW (eastern Washington, northern Idaho, northern Oregon), cereal grass aphid has expanded its range

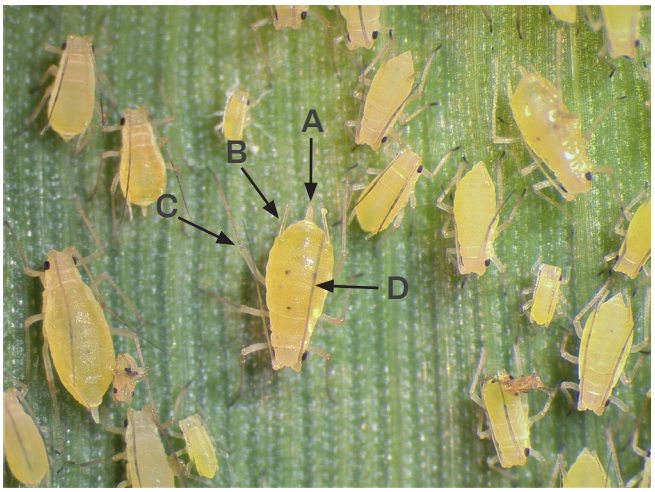


**Figure 2.** Cereal grass aphids: (**A**), lightly colored apex (cauda); (**B**), siphunculus; (**C**), long and progressively darkened leg; and (**D**), elongated darkening antenna.

**Figure 3.** A winged form of cereal grass aphid among a few wingless forms. Intersecting bands in abdomen indicated by the black arrows are faintly visible.

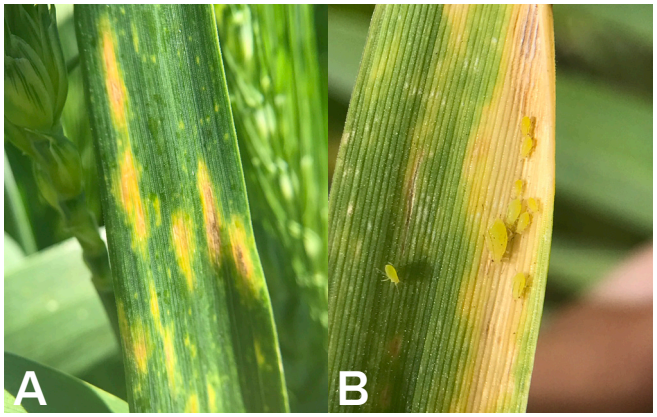


**Figure 4. A:** Red-yellow pigmented spots (or lesions) on wheat leaf due to feeding damage caused by cereal grass aphids in field condition. **B:** A wingless adult and nymphs of cereal grass aphid sitting over a large fused necrotic lesion on a wheat leaf in Idaho.

and become one of the most abundant aphid species found on wheat in the region (Figure 7; Adhikari et al. 2022). Our ongoing surveys (30–50 fields per year, 150 standardized 180° sweeps per field during the wheat-booting stage) have detected cereal grass aphids in southern Idaho and southern Montana. Two specimens were recovered in Kansas in 2018, but none since then. In addition, they have also been found in perennial grasses in Idaho, Washington, Oregon, Nevada, and California (Figure 7). Based on their current rate of rapid colonization, cereal grass aphid has the potential to expand its range in North America, particularly in wheat-growing areas.

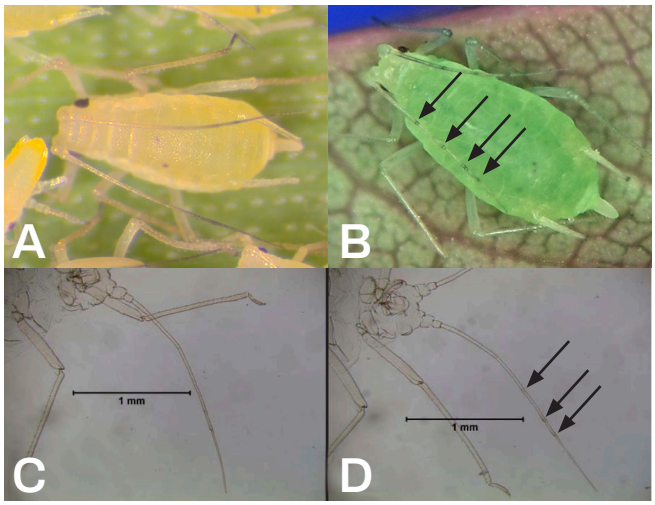


**Figure 5. A:** Wingless cereal grass aphid, showing a lack of distinct pigmentation at antennal joints. **B:** Wingless rose-grass aphid, showing prominent pigmentation near the joints of the antennae (black arrows). **C:** Antenna of wingless cereal grass aphid preserved in ethyl alcohol, showing a lack of distinct pigmentation at antennal joints. **D:** Antenna of wingless rose-grass aphid preserved in ethyl alcohol, showing the prominent pigmentation at joints of the antennae. Photo credits: **B** adapted from and courtesy of Andrew Jensen, https://aphidtrek.org/; **C** and **D** adapted from Halbert et al. 2013.

**Figure 6.** A winged form of rose-grass aphid (or rose-grain aphid), with black arrows indicating the absence of intersecting bands in abdomen. Adapted from and courtesy of Andrew Jensen, https://aphidtrek.org/.

In the PNW, cereal grass aphid mostly colonizes cereal grasses, including wheat, barley, meadow foxtail, blue wild rye, perennial bunchgrass, and bluebunch wheatgrass, but has yet to be found on corn and sorghum. Indeed, a captive colony of the aphid was unable to feed and develop on corn.

## Plant Damage and Disease Transmission

Cereal grass aphids feeding on small grain produces a distinct injury, characterized as red-pigmented spots, which later fuse to form chlorotic and necrotic patches on leaves (Figure 4). The distinct discoloration suggests that the salivary proteins of cereal grass aphids may be phytotoxic, promoting physiological responses from the affected hosts. A greenhouse study (Eigenbrode et al. 2022) suggests that damage by cereal grass aphid causes crop biomass or yield loss similar to that instigated by Russian wheat aphid (*Diuraphis noxia*), a globally destructive aphid pest in wheat, and higher yield loss than that caused by bird cherry-oat aphid (*Rhopalosiphum padi*), both common to the region.

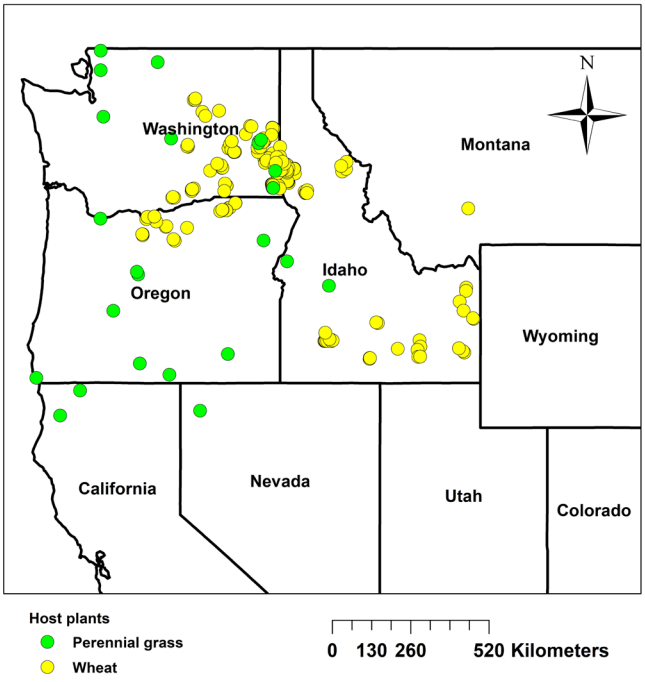


**Figure 7.** Cereal grass aphid distribution in the PNW. Cereal grass aphid detection points on wheat fields are based on the annual surveys between 2011 and 2021, whereas those on perennial grasses are based on Jensen (2021).

The status of cereal grass aphid as a vector of *Barley yellow dwarf virus* (BYDV) has yet to be verified. BYDV is transmitted by several species of cereal aphids and is a concern in the inland PNW production system and globally, because it can cause significant yield losses in some years. While a previous study (Sadeghi et al. 2016) concluded that this aphid cannot transmit BYDV, our recent preliminary experiment suggests otherwise. However, in that study, the efficiency of BYDV transmission by cereal grass aphids appears to be considerably lower than that of bird cherry-oat aphids. Whether or not cereal grass aphid is a suitable virus vector, based on greenhouse studies and a regional multiyear aphid survey this aphid can still indirectly promote virus spread by potentially facilitating population growth of a known vector of BYDV, bird cherry-oat aphids feeding on the same plant (Foote et al. 2017).

## Sampling, Economic Threshold, and Management

Growers need to scout their cereal crop fields vigilantly, beginning before the booting stage, to detect these aphids (see its identifying features in "Identification and Biology"). This can be done using sweep nets and making 150 sweeps along a zigzag transect in a field. Any colorful necrotic injury (Figure 4) present in wheat, other cereal crops, or wild grasses can suggest cereal grass aphid presence. Close inspection of visibly injured plants should include searching for aphids on the underside of leaves.

Other than generalist predators such as lady beetle and lacewing larvae and adults, little is known about specialized natural enemies of cereal grass aphids. Several parasitoids have been reared from field-collected individuals of cereal grass aphid in North America. Others have been reported in its native range, but the full range of its natural enemies and their potential to suppress the aphid's populations are unknown.

Because of its recent arrival and establishment in North America and limited studies done on its economic thresholds (currently under investigation), no formal recommendations for the management of cereal grass aphid exist. Thus, until researchers provide more studies of this aphid, use the management threshold for the Russian wheat aphid as a gauge, since its phenology, occurrence, and injury level are similar to the cereal grass aphid. Please visit the relevant entry on Russian wheat aphids in the Pacific Northwest Insect Management Handbook for this information and consult its current list of recommended insecticides to control cereal aphids.

## Further Reading


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