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Aphids in small grains

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Quick Facts

Several kinds of aphids infest small grains.
The Russian wheat aphid (RWA), a newly-introduced pest in Colorado, and the greenbug are the most destructive species in the state.
Chemical control of other aphid species rarely is necessary.
Use the key (Figure 1) and the aphid descriptions (Table 2) to determine that aphids are present in the crop.

Russian Wheat Aphid

The RWA was first reported in Colorado in March 1986. Good RWA management practices currently emphasize cost-effective use of insecticides and certain cultural practices. Long-term research may result in resistant varieties or biological control agents effective enough to replace the need for insecticides in many cases.

The RWA damages small grains by injecting saliva into and sucking sap from plants. Yield losses of 50 percent or more to this pest can be expected if economic infestations are left untreated. During the past three years US research has shown that RWA is not an important vector of barley yellow dwarf virus or other cereal diseases.

Figure 1: The Russian wheat aphid.

This information provided by:

1. Colorado State University Cooperative Extension entomologist and associate professor, entomology. Illustrations by T. J. Weissling. Table 2 and figures prepared with help of W. Don Fronk, emeritus professor, entomology. 1/92. Some recommendations change regularly. Please contact your Colorado State University Cooperative Extension county office for current recommendations.

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Colorado State University Cooperative Extension

Life Cycle

Two forms of RWA are found in Colorado during the year: a wingless female and a winged female. It is difficult to determine if an individual aphid will be winged or wingless until it is near maturity.
In Colorado, most severe spring infestations of winter grains are caused by wingless aphids that overwintered in the crop. Winged aphids begin to appear in Colorado in April and May and flights peak during July in most wheat-producing areas of the state.

Winged aphids infest late maturing winter wheat and spring grains, but they will not infest corn, millet or sorghum. They also will infest a number of cool-season grasses, particularly wheatgrasses.

These grasses serve as alternate hosts for RWA during the period between grain harvest and the appearance of new wheat in the fall. Volunteer wheat and barley also may become infested. Volunteer wheat and barley are important sources of RWA for the new fall crop as soon as it emerges.

A second flight occurs in late October and early November that infests winter wheat. RWA can survive the winter in most Colorado grain growing areas, except the San Luis Valley. The only winter weather pattern observed to cause significant RWA mortality in Colorado is several cycles of wet snow followed by a rapid melt and a quick freeze.

Signs of Infestation

RWA can be found in winter wheat, usually on the younger leaves, from emergence in the fall to grain ripening. Aphid feeding prevents young leaves from unrolling. RWA colonies are found within the tubes formed by these tightly curled leaves. This not only makes it difficult to achieve good insecticide coverage, but also interferes with the ability of predaceous and parasitic insects to reach and attack aphids.

New beneficial insect species better able to attack RWA are being sought in areas where the aphid is native. Promising species are being imported and released by the Colorado Department of Agriculture.

Leaves infested by RWA have long white, purple or yellowish streaks. Under some conditions, infested **wheat** tillers have a purplish color. Heavily infested plants are stunted and some may appear prostrate or flattened.

After flowering, some heads are twisted or distorted and have a bleached appearance. Heads often have a "fish hook" shape caused by awns trapped by tightly curled flag leaves. At this time most RWA are found feeding on the stem within the flag leaf sheath or on developing kernels. There may be poorly formed or blank grains and the entire head sometimes is killed.

Figure 2: Discoloration caused by the Russian wheat aphid.

Figure 3: Wheat plants damaged by the Russian wheat aphid.

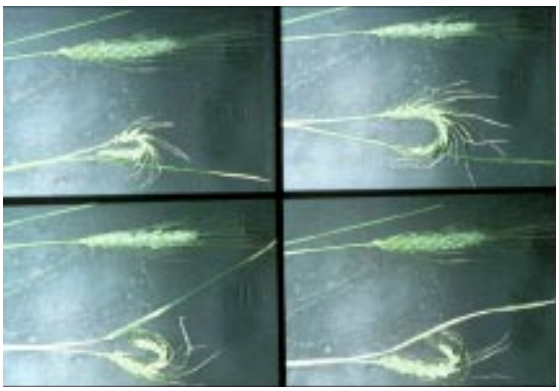

Figure 4: "Fish hoot" distortion caused by trapped awns. Each damaged head is compared to an undamaged head.

Cultural Controls

Although insecticides provide the most effective RWA control, several other practices can help minimize the need for chemical applications.

1. ***Control volunteer wheat and barley.*** Although many grass species help RWA survive the summer, volunteers are the most important source of infestation for the new crop in the fall. Try to have a three week volunteer-free period prior to emergence of fall seedings.

2. ***Adjust planting dates.*** Plant winter wheat as late as possible in northeast and western Colorado. Recommended planting dates have not been determined for southeast Colorado. Spring grains should be planted as early as possible.

3. ***Produce a healthy, stress-free crop.*** RWAs often get their start in stressed fields or stressed portions of fields and cause relatively more damage to stressed plants. Test the soil and fertilize accordingly. Plant certified, treated seed. Some winter wheat varieties grown in Colorado are slightly more resistant to RWA than others, although all varieties have been severely damaged. It is more important to select a variety that is well adapted to local growing conditions. RWA-resistant varieties are being developed but will not be available until the mid 1990s.

Although there are few differences in RWA resistance among winter wheat varieties, there are important differences among the small grains. Oats are resistant to RWA. Although heavy infestations have been observed, little economic damage has been detected. For feed grain production consider replacing barley, the most susceptible small grain, with triticale, which is moderately resistant to RWA.

Insecticides

Insecticides recommended for RWA control are in the *Colorado Pesticide Guide--Field Crops*, which is updated annually and available in any Cooperative Extension county office. **Be sure to read and follow all label directions.**

There are several insecticides not currently listed in this guide that could potentially receive emergency registrations for RWA control on small grains. Check with a local Cooperative Extension agent to determine if any such registrations are in effect.

Insecticides may be applied at one of several times during the growing season.

Planting-time soil treatments

Treatments with granular or liquid systemic insecticides can control RWA for a substantial period of time depending on rainfall. Since a RWA flight normally occurs six to eight weeks after planting, such treatments may not last long enough.

Consider using planting-time treatments when the risk of fall infestation is high, for example: when planting near uncontrolled volunteers; when planting near other common alternate hosts such as one of the wheatgrasses; or if the area has a history of fall RWA infestations.

Fall aerial or ground applications of foliar insecticides

These should be considered if more than 10 percent to 20 percent of the plants in a field show RWA damage. To determine the level of infestation walk a diagonal or zigzag pattern across the field and stop at least 10 times to examine 20 consecutive plants. It also is best to examine some damaged plants for RWA, but they may be difficult to find on cooler days or during bad weather. Scout fields every two weeks in the fall. Visit a field more frequently if a RWA infestation is detected. Fall control generally has been more effective than spring control. Increased winter injury and some loss of yield potential can be expected if treatment is delayed until spring.

Spring insecticide treatments

These are recommended according to the guidelines below. Plants with even a single infested or damaged tiller should be considered infested.

Regrowth to early boot stage	5 percent to 10 percent damaged and infested **plants**.
Early boot to flowering	10 percent to 20 percent damaged and infested **plants**.
After flowering	More than 20 percent damaged and infested **tillers**.

An alternative method to determine the need for treatment is to walk a diagonal or zigzag pattern across the field, stop 10 times and collect 10 tillers **at random** at each stop. (Avoid bias in selecting tillers at each stop. For example, take the 10 tillers closest to your foot or every fifth tiller starting with the one closest to your foot).

Examine the tillers and count the number that contains RWA. This number is the percent infested tillers and can be compared to the economic threshold calculated with the following formula:

$$ET = \frac{CC \times 200}{EY \times MV}$$

where:

- ET = Economic threshold or the percent infested tillers above which an insecticide application will be cost effective.
- CC = Control cost per acre (insecticide plus application)
- EY = Expected yield per acre
- MV = Market value per bushel

After flowering substitute 500 for 200 in the numerator of the formula. If the calculated ET is lower than the percent infested tillers observed, a treatment should be cost effective. There probably is no benefit from insecticide applications made after the crop has reached the soft dough stage.

Scout fields at least weekly in the spring. Spring treatments should be made by applying the maximum allowable rate with aerial or ground equipment.

Make ground applications in at least 10 gallons of spray volume per acre. Aerial applications can be made in one gallon of spray volume per acre when the crop is small and after flowering, but two gallons per acre is recommended for large plants prior to heading.

Systemic insecticides and some contact insecticides have performed well in Colorado if the crop is not stressed. If the crop is stressed, consider using a contact insecticide alone or a contact/systemic tank mix. **Avoid herbicide/insecticide tank mixes if the crop is stressed.**

Cool temperatures can interfere with the plant's ability to absorb systemic insecticides. If greenbugs are present in the field do not use Di-Syston without including parathion or some other insecticide that is effective against this pest.

Insecticide applications generally are cost-effective in Colorado, but do not completely prevent yield losses.

Control of Greenbug and Other Aphids

Like the RWA, greenbugs damage small grains by injecting toxic saliva into and sucking sap from the plant. It also is an important vector of barley yellow dwarf virus.

For economical control of the greenbug combine biological control, cultural practices and, if necessary, insecticide treatments. Lady beetles and parasitic wasps often keep the greenbug below economically important levels. Certain barley varieties are resistant to greenbugs and can help reduce the need for insecticide treatments.

Table 1 gives guidelines to treat greenbug and other small grain aphids. Insecticides for control of small grain aphids also are found in the *Colorado Pesticide Guide--Field Crops*.

Greenbugs are resistant to some insecticides. Ask the county Cooperative Extension agent if any products have failed in the area.

Table 1: Guidelines for treating aphids in small grains (excluding RWA).

Type of Aphid	Aphids/stem that justify chemical control		
	Seedling	Boot to heading	After heading
Greenbug	5-15	25	Treatment is rarely economical
Corn leaf aphid	20	30	
Oat bird-cherry aphid	20	30	
English grain aphid	30	50	

Table 2: Characteristics of aphids on Colorado small grain.

Apple grain aphid (*Rhopalosiphum fitchii*)	Yellowish green with darker green mottling, orange area about cornicle. Cornicle--yellowish with black tip. On oat and wheat. April-June and September-November, throughout state.
Corn leaf aphid (*Rhopalosiphum maidis*)	Abdomen pale green with dusky lateral areas. Cornicle and appendages--dusky. On small grains and sorghum. March-November, throughout state.
English grain aphid (*Macrosiphum avenae*)	Grass-green, sometimes yellowish or pinkish brown on head, frequently with dusky blotch on abdomen. Cornicle--entirely dusky to black. On small grains. May-November, throughout state.
Greenbug (*Schizaphis graminum*)	Yellowish-green, darker green longitudinal streaks. Cornicle--pale with dusky tip. On small grains and sorghum. April-August, throughout state.
Green peach aphid (*Myzus persicae*)	Pale green with darker green longitudinal stripes. Cornicle--pale with dusky tip, slightly swollen. Sorghum and small grains. Throughout season, throughout state.
Mediterranean grain aphid (*Rhopalosiphum rufiabdominalis*)	Medium green marked with red or orange. Cornicles--dusky to black. On wheat. November-December, eastern Colorado.
Oat bird-cherry aphid (*Rhopalosiphum padi*)	Medium green with orange posterior. Cornicles--brownish with black tips. On wheat. December-February, NE Colorado. (Difficult to separate from apple grain aphid.)
Rose grass aphid (*Metopolophium dirhodum*)	Yellow to pale green. Cornicle--pale and dusky at tip. On oats. July-October, throughout state.
Rusty plum aphid (*Hysteroneura setariae*)	Dark chocolate-brown. Cornicle--black. On wheat. May-November, throughout state.
Russian wheat aphid (*Diuraphis noxia*)	Pale green. Cornicle--very short. Obvious tubercle above cauda. On small grains. Seasonal occurrence unknown, could occur throughout state.
Western wheat aphid (*Diuraphis tritici*)	Pale yellow to green. Cornicle--very short. On wheat. May-October, eastern Colorado.

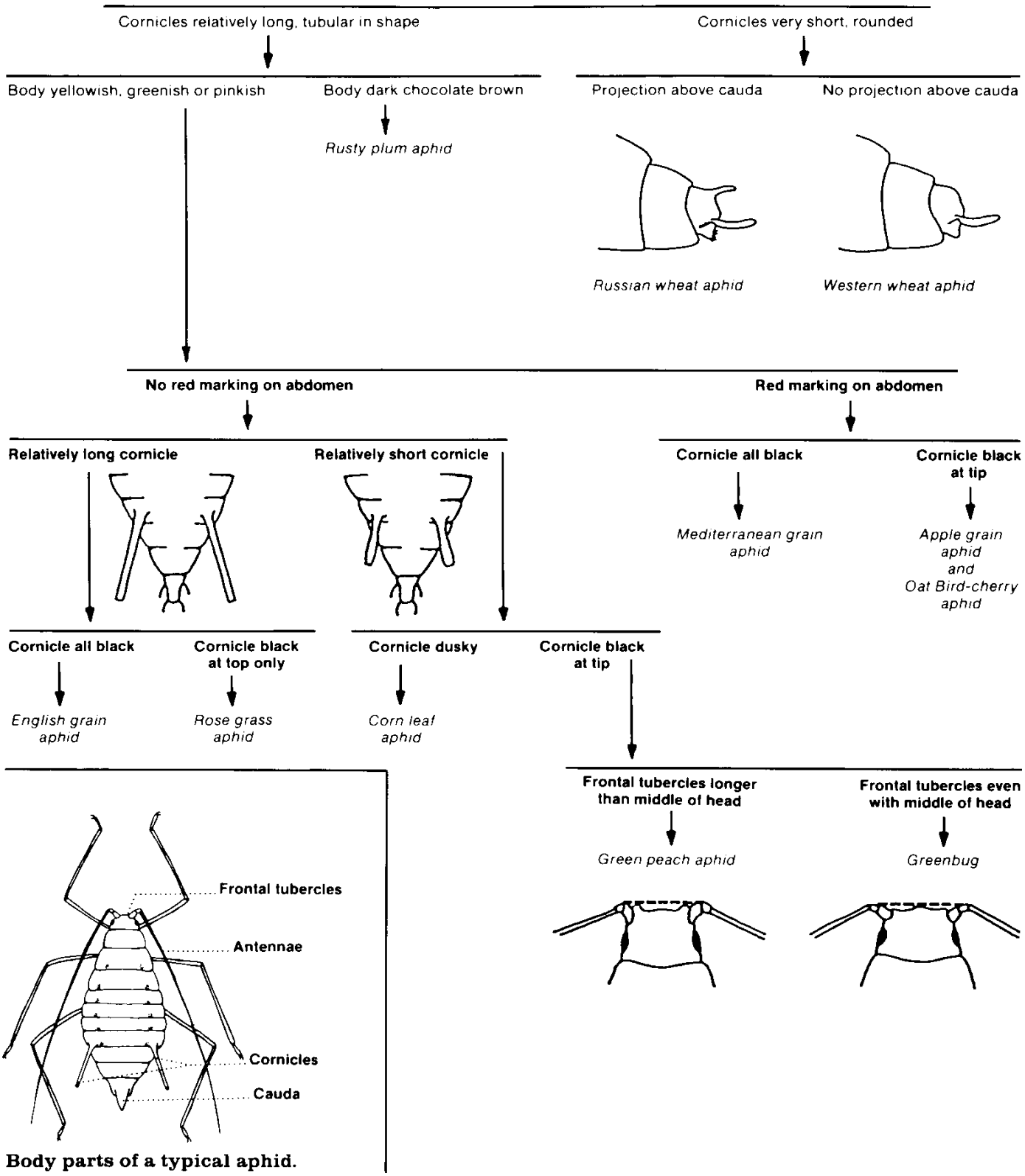

Figure 1: Key to common wingless aphids on Colorado small grains.