Colorado State University
Extension

Aphids in Small Grains

Fact Sheet No. **5.568** Insect Series | **Crops**

by F.B. Peairs*

Russian Wheat Aphid

The Russian wheat aphid (RWA) was first reported in Colorado in March 1986. Good RWA management practices have emphasized resistant varieties, cost-effective use of insecticides and certain cultural practices. Resistant varieties and biological control agents have been effective enough to replace the need for insecticides in many cases, however, recent occurrence of new biotypes have made resistant varieties much less useful.

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. U.S. 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.

Figure 2: Discoloration caused by the Russian wheat aphid.

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 April and May and flights peak during July in most wheat-producing areas of the state. At this time, winged aphids include both local aphids and immigrants from the south.

Winged aphids infest late-maturing winter wheat and spring grains but not corn, millet or sorghum. They also infest a number of cool-season grasses, particularly wheatgrasses. Damage to newly seeded grasses can be significant.

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. Weather conditions that favor cool season grasses and volunteers will increase the number of aphids infesting the new wheat crop in the fall.

Movement to the new crop occurs in October and early November. RWA can survive the winter in most Colorado grain growing areas, except the San Luis Valley. Winter weather conditions that are detrimental to RWA in Colorado include several cycles of wet snow followed by a rapid melt and a quick freeze, prolonged exposure to temperatures below 15 degrees F, and extended periods of snow cover.

*Colorado State University Extension entomologist and professor, bioagricultural sciences and pest management. Illustrations by T. J. Weissling. 10/2014

Quick Facts

- Several kinds of aphids infest small grains.
- The Russian wheat aphid (RWA) and the greenbug are the most destructive species in the state.
- Chemical control of other aphid species rarely is necessary.
- Use the key (Figure 5) to determine what aphids are present in the crop.

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

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 were identified 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. The entire head sometimes is killed.

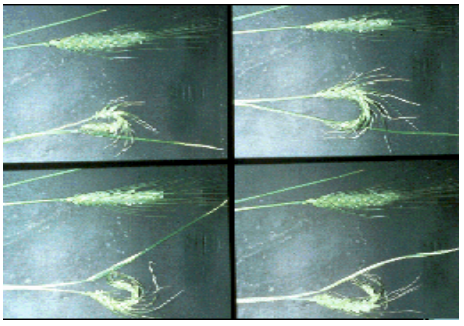

Figure 4: "Fish hook" distortion caused by trapped awns. Each damaged head is compared to an undamaged head.

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 northeastern, southwestern and western Colorado. Recommended planting dates have not been determined for southeast Colorado. Plant spring grains 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. Select a variety that is well adapted to local growing conditions.

Resistant Varieties

These resistant varieties are still the most economical and effective management option for Biotype 1. Also, they are well adapted to Colorado production conditions and should be good variety choices regardless of their resistance to Russian wheat aphid. Biotypes other that Biotype 1 must be managed with the methods developed before resistant varieties were available. These include biological control, cultural controls and judicious insecticide treatments based on appropriate scouting and economic threshold information.

There are also important differences among the small grain crop species. Oats are resistant to RWA. Although heavy infestations have been observed, little economic damage has been detected. Resistant barleys have been developed including Stoneham and Sidney.

Insecticides

Insecticides recommended for RWA control are in the *High Plains Integrated Pest Management Guide*, which is available at www.highplainsipm.org. **Be sure to read and follow all label directions**. Insecticides may be applied at one of several times during the growing season.

Planting-Time Soil and Seed Treatments

Treatments with soil systemic insecticides and certain seed treatments can control RWA for a substantial period of time if adequate soil moisture is available. Since the fall RWA flight is expected six to eight weeks after planting, such treatments may not last long enough.

The risk of significant fall infestations is generally considered to be low in Colorado. Consider using planting-time treatments only when the risk of fall infestation is high, for example: when planting near uncontrolled volunteers, when planting early, when planting near other common alternate hosts such as one of the wheatgrasses, when planting near rangeland or CRP, 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 to 20 percent of the plants in a field show RWA damage and weather conditions are expected to remain favorable for an extended period. 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 often if a RWA infestation is detected.

Fall control generally has been more effective than spring control. The risk of increased winter injury and some loss of yield potential if treatment is delayed until spring needs to be balanced against the possibility that RWA overwintering success will be low.

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 to 10 percent damaged and infested **plants**.

Early boot to flowering:

10 to 20 percent damaged and infested **plants**.

After flowering:

More than 20 percent damaged and infested **tillers**.

A more accurate 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). More efficient sampling procedures are described in *Sampling Russian Wheat Aphid in the Western Great Plains*, Great Plains Agricultural Council Publication 138.

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

ET = (CC * 200) / (EY * 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 foliar treatments have been the most common type of treatment in Colorado. Chlorpyrifos is available in several restricted use products and has been the most consistent product commercially. Both cool temperatures and drought stress can interfere with the plant's ability to absorb systemic insecticides. 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.**

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 prior to jointing and after flowering. Otherwise, use 2 gallons per acre.

If greenbugs are present in the field, see the recommendations below.

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

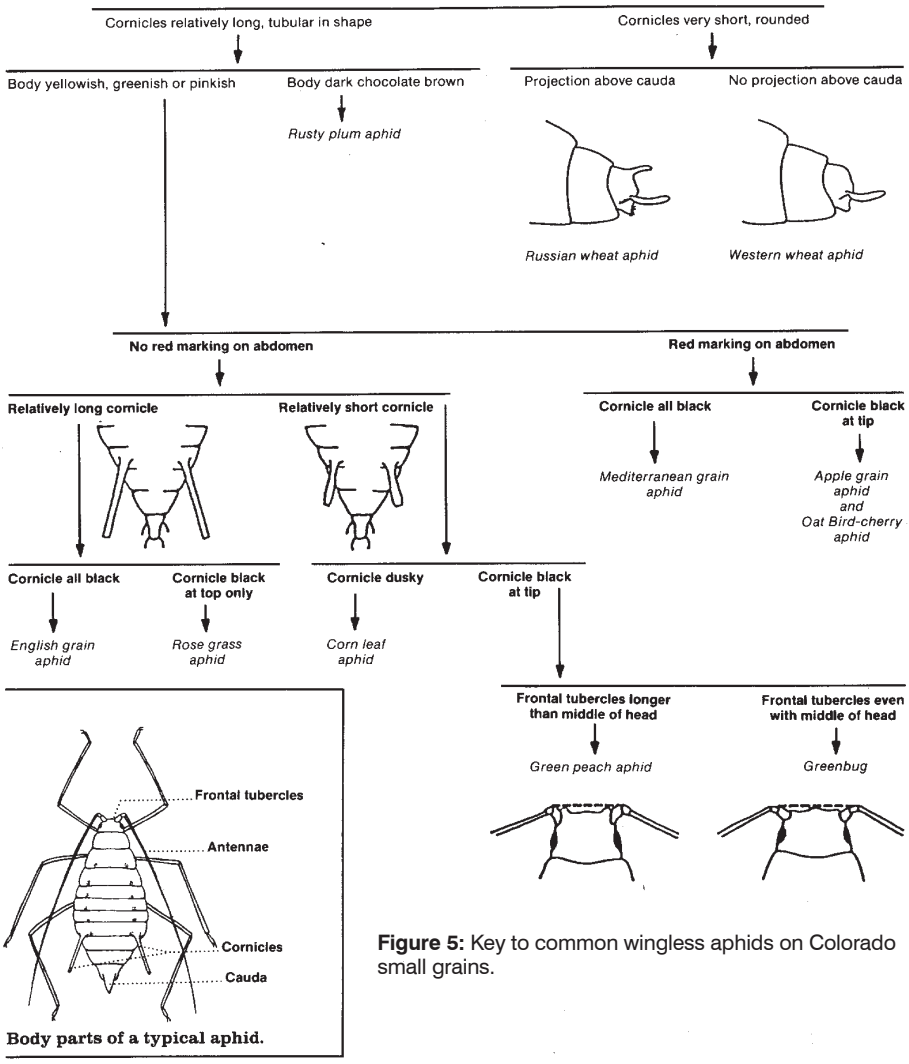

Figure 5: Key to common wingless aphids on Colorado small grains.

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. Insecticides for control of small grain aphids are found in the *High Plains Integrated Pest Management Guide* (www.highplainsipm.org).

Some greenbugs are resistant to some insecticides. Resistant greenbugs are not widespread. If a control failure is experienced, it is unlikely that control will be achieved by retreatment with the same product or a different insecticide from the same chemical family. Most insecticides currently registered on small grains are from one of two closely related families. The best way to avoid such problems is to treat greenbug infestations only when it is absolutely necessary, based on greenbug or RWA action thresholds. Ask your local Colorado State University Extension county office or other reliable source if these or other products have failed in the area.