

1996

NF96-307 Managing the Russian Wheat Aphid with Resistant Wheat Varieties

John Thomas

University of Nebraska--Lincoln, jthomas2@unl.edu

Gary Hein

University of Nebraska--Lincoln, ghein1@unl.edu

David Baltensperger

Lenis Alton Nelson

University of Nebraska-Lincoln, lnelson1@unl.edu

Scott Haley

Follow this and additional works at: <http://digitalcommons.unl.edu/extensionhist>

 Part of the [Agriculture Commons](#), and the [Curriculum and Instruction Commons](#)

Thomas, John; Hein, Gary; Baltensperger, David; Nelson, Lenis Alton; and Haley, Scott, "NF96-307 Managing the Russian Wheat Aphid with Resistant Wheat Varieties" (1996). *Historical Materials from University of Nebraska-Lincoln Extension*. 1073.
<http://digitalcommons.unl.edu/extensionhist/1073>

This Article is brought to you for free and open access by the Extension at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Historical Materials from University of Nebraska-Lincoln Extension by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.



NebFact



Published by Cooperative Extension, Institute of Agriculture and Natural Resources,
University of Nebraska-Lincoln

Managing the Russian Wheat Aphid with Resistant Wheat Varieties

*By John Thomas, Research Coordinator, Entomology
Gary Hein, Extension Entomologist
David Baltensperger, Wheat Breeding Specialist
Lenis Nelson, Extension Crops Specialist
Scott Haley, Wheat Breeding Specialist, Colorado State University*

The Russian wheat aphid (RWA) is now one of the most serious insect pests of winter wheat in the west-central Great Plains. This insect was first identified in the United States in 1986 and within a few years spread across the arid wheat and barley production areas of the United States and Canada. Currently, and in the future, management of the Russian wheat aphid will depend heavily on the development and use of varieties resistant to the aphid. Colorado State University (CSU) has developed several commercially available varieties of winter wheat with good resistance to the Russian wheat aphid. Currently available varieties are Halt, Prairie Red, Prowers 99 and Yumar. In 2001, Kansas State University at Hays released Stanton, a variety derived from a different source of Russian wheat aphid resistance than the varieties from Colorado State University. Stanton has not been tested in Nebraska variety trials.

Halt was the first wheat variety released with significant resistance to the Russian wheat aphid (1994) and in western Nebraska remains competitive with other commercial varieties in both quality and yield. Studies in western Nebraska and Colorado have shown that Halt demonstrates a very good level of resistance to the Russian wheat aphid through the entire season. The nature of this resistance changes through the season, but aphids may be found on Halt throughout the season. In the fall, Halt shows a high level of tolerance which means that Russian wheat aphids survive on Halt in numbers often equal to those on susceptible varieties, but the leaves do not curl and streak which is common on susceptible varieties. Tolerance is maintained into the spring, and because the plant leaves do not remain curled in response to aphid feeding, protection from predators, parasites and the weather decreases. In the spring, the reproductive rate of the aphid is also slowed on Halt, and populations are much lower than those found on susceptible varieties (*Figure 1*).

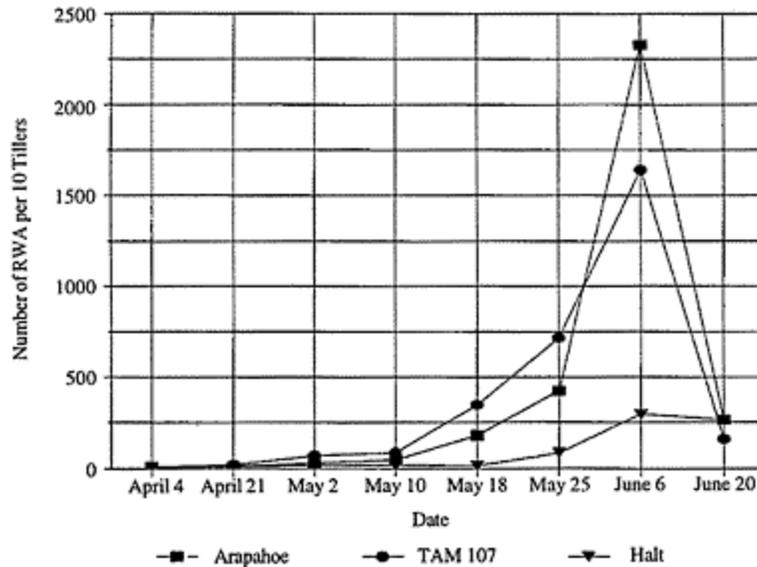


Figure 1. Spring population growth of Russian wheat aphids on Halt (resistant), Arapahoe (susceptible) and TAM 107 (susceptible) winter wheat, Scottsbluff, 1994.

Because Halt resists aphid damage, it maintains normal yields under heavy Russian wheat aphid pressure. In 1994 and 1996 field trials, plots artificially infested with Russian wheat aphid had 60-80 percent of wheat tillers infested by mid May. Russian wheat aphid infested plots, when compared to non-infested check plots, resulted in 29-46 percent yield losses in 'TAM 107' and 'Arapahoe' (susceptible varieties), while Halt showed no significant yield loss. Halt demonstrated a significant yield advantage over susceptible varieties under heavy Russian wheat aphid pressure (*Figure 2*).

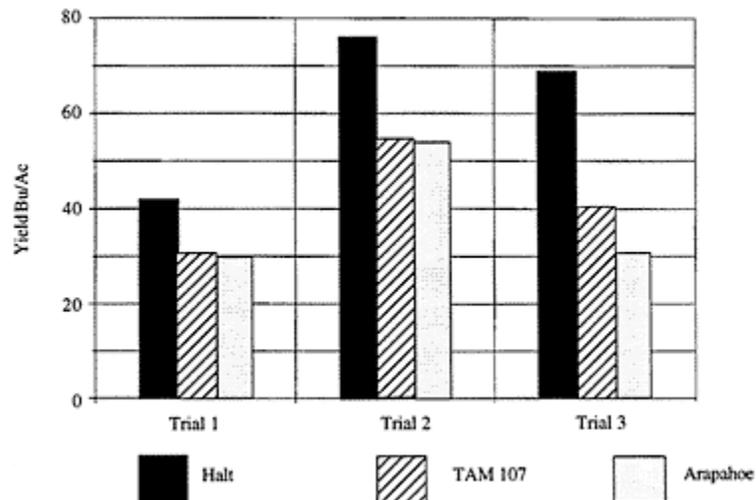


Figure 2. Yields following spring infestations of Russian wheat aphid for winter wheat varieties, Halt (resistant), Arapahoe (susceptible) and TAM 107 (susceptible). (Trial 1, High Plains Agricultural Laboratory, Sidney, 1994; Trial 2, Panhandle Research and Extension Center,

Scottsbluff, 1994; Trial 3, High Plains Agricultural Laboratory, Sidney, 1996).

Prairie Red, Prowers 99 and Yumar are resistant to Russian wheat aphid, having the same source of resistance as Halt. These varieties vary in yield and quality but respond similarly under Russian wheat aphid infestation. Halt, Prowers 99 and Yumar were compared in Nebraska Small Grain Variety Tests in the Nebraska Panhandle from 1998 through 2001 in both dryland and irrigated variety trials.

The four-year average grain yields varied, but the RWA-resistant varieties were competitive with commonly grown varieties (*Tables I and II*). Russian wheat aphid infestations for all of these trials ranged from light to non-existent. Halt continues to be a benchmark for RWA-resistant wheat varieties in both quality and yield when grown in western Nebraska. Halt is a white chaff, semi-dwarf wheat with early maturity, fair to good winter hardiness, good straw strength and good milling and baking qualities. The variety is susceptible to leaf rust and should not be grown in areas where rust could be a problem. Halt is best adapted to western Nebraska where Russian wheat aphid problems are most likely to occur.

Table I. Dryland production. Four year average winter wheat yield for varieties tested in the Nebraska Panhandle Small Grain Dryland Variety Trials 1998-2001 (22 trials).

| Variety | Grain Yield | Bushel Weight | Grain Protein | Plant Height |
|-----------|--------------|---------------|---------------|---------------|
| | <i>bu/ac</i> | <i>lb/bu</i> | <i>Pct</i> | <i>inches</i> |
| Alliance | 52.4 | 58.8 | 11.7 | 30 |
| Halt* | 50.7 | 58.2 | 12.5 | 28.0 |
| Arapahoe | 48.4 | 58.1 | 12.7 | 32.0 |
| Pronghorn | 47.7 | 59.4 | 12.4 | 35 |
| Power 99* | 46.3 | 60.6 | 12.4 | 34 |
| Buckskin | 45.7 | 59.7 | 12.7 | 36.0 |

* Varieties with good Russian wheat aphid resistance.

Prowers 99 is a medium tall to tall wheat with good winter hardiness, medium-late maturity, fair straw strength, and good quality. Leaf rust resistance has not been fully tested, but moderate resistance to leaf rust similar to the variety Lamar is expected. Prowers 99 has demonstrated only moderate yield potential, comparable to Pronghorn and Buckskin, in the Nebraska trials. Yumar is a medium short wheat variety with early maturity, fair to poor winter hardiness, good to very good straw strength, and good baking quality. Yumar is also susceptible to leaf rust. Yumar is not recommended as a dryland wheat, but has done well in irrigated trials in western Nebraska and Colorado.

Prairie Red is another resistant semi-dwarf wheat with early maturity, fair to good winter hardiness, and good straw strength. Prairie Red was derived by backcrossing the Russian wheat aphid resistance gene in Halt into Tam 107, and thus, its baking quality characteristics are identical to Tam 107. The variety is also susceptible to leaf rust and should not be grown in areas where rust has been a problem. Prairie Red has demonstrated good yield potential in western Nebraska, but because of its poor baking quality, it is not recommended for Nebraska. Prairie Red is not listed in *Table I* because only three years of data were available.

Table II. Irrigated production. Four year average winter wheat yield for varieties tested in the Nebraska Panhandle Small Grain Dryland Variety Trials 1998-2001 (seven trials).

| Grain | Bushel | Grain | Plant |
|-------|--------|-------|-------|
|-------|--------|-------|-------|

| Variety | Yield | Weight | Protein | Height |
|----------------|--------------|---------------|----------------|---------------|
| | <i>bu/ac</i> | <i>lb/bu</i> | <i>Pct</i> | <i>inches</i> |
| Millennium | 90.8 | 59.0 | 11.8 | 37 |
| 2137 | 86.6 | 58.2 | 11.1 | 34 |
| Yumar* | 84.9 | 57.9 | 11.9 | 33 |
| Halt* | 83.3 | 56.4 | 12.4 | 32 |
| Alliance | 75.4 | 56.4 | 11.5 | 33 |
| Arapahoe | 75.1 | 56.5 | 12.7 | 36 |

* Varieties with good Russian wheat aphid resistance.

Colorado State University continues to lead the way in developing Russian wheat aphid resistant varieties. Some excellent varieties also are now becoming available from Kansas State University at Hays. CSU wheat breeders are hoping to release a version of the variety Akron that is resistant to the Russian wheat aphid by fall 2002, and are targeting either or both a hard white and Clearfield variety release by fall 2003 or 2004.

Russian wheat aphid infestations have been highly variable in the 15 years since they were discovered in the United States. Certain years have resulted in widespread heavy infestations while other years have had very limited and isolated populations. Weather is a key factor in Russian wheat aphid population dynamics. Winters with prolonged snow cover, cool wet springs, and hot dry conditions in summer all greatly limit buildup of aphid populations, while warm dry conditions during the growing season favor population growth. We expect continued Russian wheat aphid problems when weather conditions are favorable for population development, and resistant varieties are the most economical management tool. In areas where Russian wheat aphid has been a problem in the past, resistant varieties should be included in the complement of wheat varieties planted.

File NF307 under: INSECTS AND PESTS

C-5, Field Crops

Revised September 2002

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Dean and Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

University of Nebraska Cooperative Extension educational programs abide with the non-discrimination policies of the University of Nebraska-Lincoln and the United States Department of Agriculture.