

Russian Wheat Aphid (Diuraphis noxia) Overwintering

## Alternate Host Plant Study

Scott Armstrong and Jeff Rudolf<sup>1/</sup>Purpose:

To examine all grass species that are actively growing between harvesting wheat (late July) and planting wheat in the fall (mid. Sept.). Once alternate host plants that "overwinter" the Russian Wheat Aphid (RWA) are established, control of these alternate hosts may be initiated depending upon the host plants habitat (i.e. is it a native grass in an established pasture adjacent to wheat or an annual grass that emerges through wheat stubble). Grasses sampled in this study also included volunteer wheat, volunteer barley, grain sorghum and proso millet.

Methods & Materials:

A series of twenty light bulb driven burlese funnels were made from 8" PVC (13" tall) by cementing a metal funnel to one end of the PVC. A wooden top was made to fit the upright end with a fixture for a 60-watt clear light bulb. A 1/16" screen was also cemented where the PVC and funnel joined to keep larger debris from falling through. All the funnels were placed in a wooden frame for easy access. A dimmer switch was used in between the plug-in and the light fixtures so that the light intensity could be increased or decreased evenly. The Burlese funnels were allowed to operate for 12 hours. The temperature inside the funnels was 55°C near the light bulb and 45-50°C near the base of the screen. The aphids captured were separated into 1) those with no wing

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<sup>1/</sup> Research Associate and Research Technician, Colorado State University Experiment Station, Akron, CO.

development, 2) wing pads showing, and 3) fully developed wings.

Grasses were clipped at three different locations at ground level and placed in a one gallon Ziplock® bag. This was considered a sampling unit.

Site #1 - is a cultivated wheat and barley area termed a Loamy Plains Range site with a draw running through it. The location was two miles south and two miles west of Arriba, CO in Lincoln County. Grasses sampled were any native grass in the draw, on the roadside, or emerging through the wheat and barley stubble. In summary, any grass species including volunteer that was associated with the cultivated area, twenty-three grasses were sampled, Tables 1 and 2. The RWA was a definite threat to wheat production during the 1987 and 1988 growing seasons surrounding this site.

Site #2 - is characterized by a Sandy Plains Range site on the edge of a cultivated wheat area with native grasses. The location is 4 miles northwest of Akron, CO in Washington County. Grasses sampled at this location were taken as previously mentioned above. The grass species numbers were not as high at this location (17) and are listed in Table 3. Russian wheat aphid populations were light and spotty during the 1988 growing season surrounding this sampling site.

#### Results and Discussion:

Survey data from Fig. 1 gives the total number of aphids captured from all grasses sampled on the given sampling date. The greatest differences of capture between sampling dates occurred the first and second week sampled. July 29 yielded 117 nymphs without any wing development and only 7 being captured on Aug. 3. Capture for the remainder of the summer and early fall is variable. From Aug. 10 to Sept. 14 there were

aphids captured with wing development (Fig. 1). On Sept. 5 there was one aphid captured with fully developed wings. Figure 1 shows that annual and perennial grasses serve as an overwintering host for the RWA.

Figure 2 presents the five grasses from the Arriba location that yielded >5 aphids over the summer and early fall sampling dates.

Canada wildrye by a wide margin was the most prolific host of any of the top five grasses, Fig. 2. It also was the only grass sampled that showed wing development. This could likely mean that the RWA can reproduce on Canada wildrye and only exists on the other grasses. However, this study was not designed to determine if reproduction occurred on each individual plant.

The total number of aphids captured from 17 different grasses sampled from the Akron location is given in Fig. 3. Here we have sporadic results with the dates Aug. 15 and Sept. 29 not yielding any aphids. Fig. 3 indicates that native and introduced grasses did serve as overwintering alternate host at the Sandy Plains Range site at Akron.

Individual grasses that yielded >5 aphids from the Akron location is graphed in Fig. 4. There were six species with more than 5 aphids collected between July 29 and Sept. 14, 1988. Crested wheatgrass served as the most prolific host with a total of 17 aphids captured. There were no aphids captured in this Akron site on the six best host that displayed any wing development, Fig. 4.

Volunteer wheat and barley were sampled in the same manner as the native and perennial grasses. Fig. 5 gives the results of the wheat survey. Volunteer wheat was evident a week prior to the first capture date of Sept. 5 and was in the 1-2 leaf stage. One week later after a

rain the aphids increased by 2 times, and wing development occurred. The wheat was already in the 2-3 leaf stage at this time.

Aphids were captured two weeks earlier on volunteer barley when compared to wheat. The numbers captured were higher in the barley than in the wheat. This is evident when comparing the aphid scale of volunteer wheat (Fig. 5) to the volunteer barley (Fig. 6).

Summary:

When comparing the grasses that yielded the highest aphid numbers from the Arriba and Akron sites, it appears as if reproduction was occurring at the Arriba site on the Canada wildrye due to the number of aphids exhibiting wing development. This is only theoretical since this study was not designed to show reproduction on any of the annuals or perennials sampled.

The Crested wheatgrass appeared to be the better host from the Akron location. Barnyard grass, Canada wildrye and Western wheatgrass were three grass species that served as oversummering host at both locations. Blue grama and Cheatgrass were abundant hosts at Arriba and were not at the Akron location. Crested wheatgrass, Green foxtail, and Prairie sandreed were abundant hosts at Akron and not at Arriba.

This survey shows that there are annual and perennial grasses that obviously helped "oversummer" the RWA. The fact that they can actually reproduce on these plants is still unanswered. Volunteer control of wheat and barley in areas where RWA exists is a must for wheat production.

TABLE 1. Common and Scientific Names of Perennial Grasses Sampled Weekly from 8-2 to 9-14-88 on a Loamy Plains Range Site, Arriba, CO.

<u>Perennials</u>	
<u>Common</u>	<u>Scientific</u>
1. Big Bluestem	<u>Andropogon gerardii</u> (Vitman)
2. Blue Gramma <sup>77</sup>	<u>Bouteloua gracilis</u> (H.B.K.)
3. Canada Wildrye	<u>Elymus canadensis</u> (h.)
4. Crested Wheatgrass	<u>Agropyron cristatum</u> (L. Gaertn.)
5. Prairie Sandreed	<u>Calamovilfa longifolia</u> (Hook)
6. Sand dropseed	<u>Sporobolus cryptandrus</u> (Torr.)
7. Sedge (threeleaf sedge)	<u>Carex filifolia</u> (Nutt)
8. Smooth Brome	<u>Bromus inermis</u> (Leyss.)
9. Switchgrass	<u>Panicum virgatum</u> (L.)
10. Western Wheatgrass	<u>Agropyron smithii</u> (Rydb.)

TABLE 2. Common and Scientific Names of Annual and Cultivated Grasses Sampled Weekly from a Loamy Plains Range Site, Arriba, CO, 1988.

<u>Annuals</u>	
<u>Common</u>	<u>Scientific</u>
1. Barnyard Grass	<u>Echinochloa crusgallis</u>
2. Downy Brome (cheatgrass)	<u>Bromus tectorum</u> (Leyss)
3. Green Foxtail	<u>Setaria</u> sp.
4. Sandbur	<u>Cenchrus pauciflorus</u>
5. Stinkgrass	<u>Eragrostis cilianensis</u>
6. Prairie Threeawn	<u>Aristida oligantha</u> (Michx.)
7. Witchgrass (ticklegrass)	<u>Panicum capillare</u>

<u>Cultivated Grasses</u>	
1. Foxtail millet	<u>Setaria italica</u>
2. Grain sorghum	<u>Sorghum bicolor</u>
3. Volunteer oats	<u>Avena sativa</u>
4. Volunteer barley	<u>Hordeum vulgare</u>
5. Volunteer wheat	<u>triticum aestivum</u>

TABLE 3. Common and Scientific Names of Seventeen Different Grasses Sampled Weekly from a Sandy Plains Range Site, Akron, CO. 1988.

<u>Annuals</u>	
<u>Common</u>	<u>Scientific</u>
1. Barnyard Grass (watergrass)	<u>Echinochloa crusgallis</u>
2. Downy Brome (cheatgrass)	<u>Bromus tectorum</u> (Leyss)
3. Foxtail millet	<u>Setaria italica</u>
4. Green Foxtail	<u>Setaria sp.</u>
5. Sandbur	<u>Cenchrus pauciflorus</u>
6. Stinkgrass	<u>Eragrostis cilianensis</u>
7. Prairie Threeawn	<u>Aristida oligantha</u> (Michx.)
8. Witchgrass (ticklegrass)	<u>Panicum capillare</u>
<u>Perennials</u>	
1. Blue Gramma	<u>Bouteloua gracilis</u> (H.B.K.)
2. Canada Wildrye	<u>Elymus canadensis</u> (L.)
3. Crested Wheat	<u>Agropyron cristatum</u> (..Gaertn)
4. Prairie Sandreed	<u>Calamovilfa longifolia</u> (Hook)
5. Sand dropseed	<u>Sporobolus cryptandrus</u> (Torr.)
6. Sandhill Muhly (Ring muhly)	<u>Muhlenbergia torreyi</u> (Kunth)
7. Smooth Brome	<u>Bromus inermis</u> (L.)
8. Switchgrass	<u>Panicum virgatum</u> (L.)
9. Western wheatgrass	<u>Agropyron smithii</u> (Rydb.)