APHID CONTROL AND BARLEY YELLOW DWARF VIRUS SUPPRESSION IN SPRING-SEEDED PERENNIAL RYEGRASS, WESTERN OREGON

A.J. Dreves and G.C. Fisher

Introduction

The purpose of this research is to determine if aphid control with carefully timed insecticide application reduces barley yellow dwarf virus (BYDV) symptoms and increases seed yield of perennial ryegrass (PRG) grown without irrigation in western Oregon. Two replicated field trials were initiated in the fall of 2008. The sites were located in Tangent-Oakville area (Linn County, Oregon), in a newly-planted field of PRG.

Methods

The fields were planted with proprietary seed by the grower on 10 May, 2008. Both fields had good seedling stands, were vigorous and were breaking summer dormancy in October. Fields were bordered by other grass seed fields, forested areas of oaks and conifers, and houses on the south side. A randomized block design with three replications was used in both fields. Plots were flagged on 3 October, 2008. Replications measured 250 x 105 feet and 300 x 105 feet in sites 1 and 2, respectively. Seedling grasses in both fields were monitored for aphids through the summer. Yellow water traps placed beside the fields provided aphid flight information for 2008 and 2009 (Figure 1). Very few to no aphids were detected, and plots were not treated at this time. The first foliar treatments were applied to the plots on the morning of 9 October, 2008 in response to increasing numbers of aphids detected in the yellow water traps. The morning was overcast with intermittent light rain showers (accumulated 0.02 inches) and air temperature was 47°F at time of application. The temperature the previous day was 65°F and sunny.

Liquid products were delivered in the equivalent of 12 gallons per acre with a grower-applied tractor mounted boom. A 20-nozzle boom, 36 inches above the ground and operating at 50 psi with TJ8005 nozzles covered a 70 feet swath. Insecticides applied were: imidacloprid as Admire Pro (4.6 lb a.i. per gallon) at 8 oz/acre (0.575 lb a.i./a), spirotetramat as Movento (2 lb a.i. per gallon) at 6 oz/acre (0.094 lb a.i./a), and cyfluthrin as Baythroid XL (1 lb a.i. per gallon) at 2.8 oz/acre (0.2 lb a.i./a). Three untreated check plots were included in each field within the RCB design. No surfactant was used on first application of treatments. Subsequent applications received MSO at 0.25% by volume of spray solution. Precipitation and mean temperatures during the trials were obtained from Corvallis, Oregon AgriMet station (Lat 44.6342, Long 123.30, Elev 230 ft).

Adjacent to site 1, seed was treated with Imidacloprid (equivalent of Gaucho 480) at 6 oz/cwt and seeded on 10 May, 2008. Three plots, 250 x 105 feet were flagged. These plots were also treated with a foliar spray, Mustang®, 6oz/acre on 29 October, 2008 as well as the following spring.

A second foliar application to the plots was made the following spring (29 May, 2009) as winged aphid counts increased in the water pan traps. A third spray was made in the fall to the plots at site 1 on 28 September, 2009. This was after the first seed harvest

Aphids were monitored in the plots beginning in 2008 by different methods: visually counting aphids per unit row of seedling grass during establishment year, sweep net (10 samples of ten, 180° arc) sampling in the plots as the grass grew taller, and by taking five, 6-inch core samples over the rows and 2 inches down into the soil per plot and extracting aphids with Berlese funnels. Individual grass tillers, randomly-selected (n=100 plants) within plots were rated for presence or absence of BYDV symptoms on 15 June, 2009 (slightly past peak symptom expression).

Five, 6-inch cores of grass were collected and processed from each plot prior to application of insecticides, 28 May, 2009 and again on 6 July, 2009, prior to harvest. Total numbers of aphids extracted by plot were recorded.

Plots were swathed on 10 July, 2009. On 24 July (site 1) and 25 July (site 2) individual plots were combined directly into a weigh-wagon to record seed weights that could be converted to seed lb/acre.

After 1st year harvest, a third application of three foliar products was made to site 1 on 28 September, 2009 as aphids increased in yellow water traps. The same products and rates with surfactant were used (see above). The temperature at time of application was approx. 60°F with a light wind from SW, partly cloudy. Rain fell 7 hours after application (0.01inches) and continued to fall the next day (0.10 inches) The PRG was greening and had approx. 2 inches of regrowth. These plots were evaluated for aphids on 8 October, 2009 at 10-day post application using the soil core and Berlese funnel extraction method.

Results

Aphid control. Few to no aphids were seen on seedling grasses through the summer, 2008. First sprays were applied on 9 October, 2008 in response to increased aphid numbers in yellow water traps (Figure 1). Second sprays were applied on 29 May, 2009 also in response to increased aphid numbers in yellow water traps. Aphid control was evaluated by taking five, 6-inch diameter soil cores through grass crowns randomly selected in the plots beginning in January 2009. Aphids were extracted with Berlese funnels, counted and recorded. Movento-treated plots were not evaluated. Aphid numbers

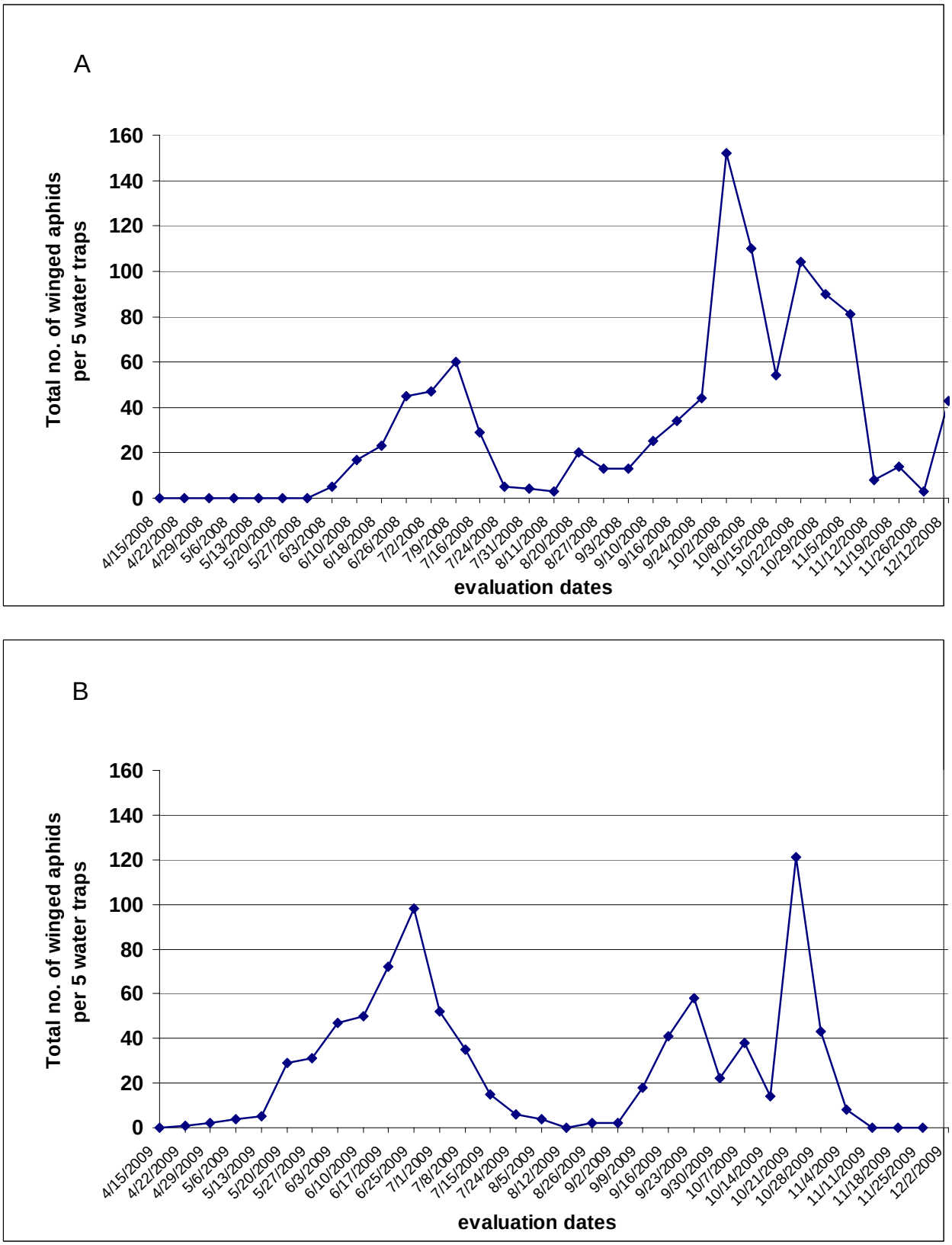

Figure 1. Winged aphid counts in yellow water traps placed on borders of established perennial ryegrass fields in the south Willamette Valley, 2008 (A) and 2009 (B).

Table 1. Aphid numbers found in treated-plots of perennial ryegrass, site 1, using Berlese funnel extraction, 2009.

Treatment[3]	Product rate/acre	Mean no. of aphids per five, 6-inch grass cores in perennial rye field [1,2]				
		22 Jan	06 Apr	28 May	6 July	8 Oct
Admire Pro	8 oz	1 b	7 a	84 a	11 a	9 b
Baythroid XL	2.8 oz	0 b	11 a	43 a	13 a	92 b
Movento	6 oz	not applicable	not applicable	not applicable	26 a	28 b
Check	--	38 a	288 a	43 a	5 a	475 a
$P < 0.05$		0.0091	0.1345	0.4051	0.2009	0.0117

[1] Means separated using Fisher's LSD, log-transformed (x + 0.01), and significance level of 0.05. Original means are presented in table.
[2] Mean numbers of aphids extracted from on five, 6-inch grass cores, replicated three times, totaling 15 cores.
[3] Field was seeded on 10 May, 2008. First, second and third applications were applied on 20 October 2008 (fall 08), 29 May 2009 (spring 09) and 28 September 2009 (fall 09), respectively. The Movento treatment was not applied until 29 May 2009.

Table 2. Aphid numbers found in treated-plots of perennial ryegrass, site 2, using Berlese funnel extraction, 2009.

Treatment[3]	Product rate/a	Mean no. of aphids per five, 6-inch grass cores in perennial rye field [1,2]			
		22 Jan	06 Apr	28 May[3]	6 Jul
Admire Pro	8 oz	1 a	1 b	38 a	5 a
Baythroid XL	2.8 oz	0 b	0 b	128 a	5 a
Movento	6 oz	not applicable	not applicable	not applicable	8 a
Check	--	11 a	65 a	76 a	23 a
$P < 0.05$		0.2137	<0.0038	0.5837	0.4081

[1] Means separated using Fisher's LSD, log-transformed (x + 0.01), and significance level of 0.05. Original means are presented in table.
[2] Mean numbers of aphids extracted from on five, 6-inch grass cores, replicated three times, totaling 15 cores.
[3] Field was seeded on 10 May 2008. First, second and third applications were applied on 29 October 2008 (fall 08), 29 May 2009 (spring 09) and 28 September 2009 (fall 09), respectively. The Movento treatment was not applied until 29 May 2009.

Table 3. Aphid numbers found in Gaucho-treated seed plots of perennial ryegrass, site 1, using Berlese funnel extraction, 2009.

Treatment[1]	Rate/cwt	Mean no. of aphids per five, 6-inch grass cores in field [2,3]				
		22 Jan	06 Apr	28 May[3]	6 Jul	8 Oct
Gaucho 480-treated seed + Mustang	2 oz.	0 b	0 b	0 a	9.3 a	111 b
Untreated check	--	37 a	288a	43 a	5.00 a	475 a
$P < 0.05$		< 0.0002	<0.0081	0.198	0.3094	0.0232

[1]Seed was treated with imidacloprid (Gaucho 480) at 4 lb/gal and applied to 29.38 acres on 10 May, 2008.
[2] Means separated using Fisher's LSD, log-transformed (x + 0.01), and significance level of 0.05. Original means are presented in table.
[3] Mean numbers of aphids extracted from on five, 6-inch grass cores, replicated three times, totaling 15 cores.

remained low during late January and early April 2009 in Baythroid and Admire treated plots of both fields; less than 5% of the numbers recorded in untreated checks (Table 1, 2, and 3). By 28 May 2009 aphids in treated plots had increased to numbers statistically equal to the numbers in the untreated plots of both fields. Winged aphids increased in water traps. Sprays were applied. On 6 July, prior to harvest, aphid counts were taken and although populations were lower in plots than in May, their numbers were not statistically different from those in the untreated plots of both fields. On 28 September, 2009, a third spray was applied to site 1. Ten days later aphids were evaluated using soil cores and Berlese funnels. Significant reductions in aphids compared to the untreated plots was noted in all treated plots (98% reduction-Admire®, 94% reduction-Movento®, 81% reduction-Baythroid). Fewer aphids were recorded through time in the untreated plots found in site 2 than in site 1, from 4 to 20 times fewer aphids during peak numbers.

Barley yellow dwarf virus control. There was a reduction of visual symptoms in treated plots compared to the untreated plots (Table 4). Site 2 had fewer aphids throughout the year. Nearly 60% of plants in untreated of field site 1 expressed BYDV-symptoms compared to 22% of plants for field site 2. These data were taken just before first harvest. At site 1, the seed treatments, plots Admire Pro and Baythroid plots had significantly fewer BYDV-infected leaves than the untreated. In site 2, none of the plots had statistically fewer infected leaves than in the untreated plots.

Grass seed yields. All treatments increased seed yields in site 1, from 2 to 8% relative to the untreated as measured by weigh wagon in the field (Table 4 and 5). However, these increases were small and not statistically significant. At site 2, Movento and Baythroid plots had increased seed yields of 6% and 4%, respectively; Admire plots had slightly depressed yields (-2%) when compared to the untreated plots in this field.

Discussion

It appears that insecticide seed treatments and foliar sprays reduce aphid numbers for a few weeks (months perhaps for the seed treatment) after application. However, it is apparent that not all aphids are controlled. Those remaining increase and move among plants. This is reflected in not only aphids counted at different times through the season, but also reflected by symptom expression of BYDV in plots. In general, yields were increased with insecticide use, but these increases were slight and not statistically significant.

The grass plots at site 1, were re-treated last fall after harvest. Data will be collected from these plots in 2010 as in the first year. Second year seed yields will be taken from these plots to determine effects of insecticide applications for aphid control over two consecutive seasons.

Table 5. Comparison of perennial ryegrass seed yield increases over untreated plots, 2009.

	Seed yield increase (lb/a) over check plots and percent increase (%)	
Treatment	24 Jul site 1	25 Jul site 2
Admire Pro	147 (7%)	-33 (-2%)
Movento	162 (8%)	131 (6%)
Baythroid XL	115 (6%)	85 (4%)
Gaucho480 Seed + Mustang	46 (2%)	Not applied

Table 4. First-year seed yield (lb/a) at two sites and visual ratings of BYDV-symptoms, 2009.

	Seed yield[1] lb/acre		BYDV-like symptoms rating per 100 tillers[3]	
Treatment	24 Jul site 1	25 Jul site 2	15 Jun site1	15 Jun site 2
Admire Pro	2175 a[2]	2119 a	37 bc	18 ab
Movento	2190 a	2283 a	49 ab	27 a
Baythroid XL	2143 a	2237 a	44 bc	13. b
Gaucho480 Seed + Mustang	2074 a	not applicable	34 c	not applicable
Check	2028 a	2152 a	61 a	22 ab
$P < 0.05$	0.7644	0.7092	0.0310	0.1035

[1] Means separated by Fisher's LSD. Means followed by the same letter are not significantly different.
[2] The 3rd rep in UTC was weak due to a low, wet area. Reduced seed yield in this rep was more of an artifact of the experiment and most likely not due to aphid pressure or effects of BYDV.
[3] One hundred random tillers were rated for presence or absence of BYDV-like symptoms.