Section VI
Pests of Turf and Ornamentals

APHID CONTROL AND BARLEY YELLOW DWARF VIRUS SUPPRESSION IN SPRING-SEEDED PERENNIAL RYEGRASS, WESTERN OREGON (2008, 2009)

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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 OR. Two replicated field trials were initiated in the fall of 2008. The sites were located in Tangent-Oakville area (Linn County, OR), in newly-planted seed of PRG.

Methods and Methods
The fields were planted with proprietary seed by the grower on May 10, 2008. Both fields had good seedling stands, were vigorous and were breaking summer dormancy in October. Fields (BL#4- site 1; BL#11- site 2) 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 October 3, 2008. Replications measured 250 x 105 feet and 300 x 105 feet in sites 1 and 2, respectively. Post-emergence, seedling grasses in both fields were monitored for aphids through the summer. Yellow water traps placed beside the fields provided aphid flight information (Figure 1). Seedling grasses were inspected through the summer, very few to no aphids were detected on them, and plots were not treated at this time. The first foliar treatments were applied to the plots on the morning of October 9th, 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: Admire Pro at 8 oz/acre, Movento at 6 oz/acre and Baythroid XL at 2.8 oz/acre. 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 May 10, 2008. Three plots, 250 x 105 feet were flagged. These plots were also treated with a foliar spray, Mustang®, 4oz/acre on October 29, 2008 as well as the following spring (Table 3).

A second foliar application to the plots was made the following spring (May 29, 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 (BL#4) on September 28, 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 June 15, 2009 (slightly past peak symptom expression).
Five, 6-inch cores of grass were collected and processed from each plot prior to application of insecticides, May 28, 2009 and again on July 6, 2009, prior to harvest. Total numbers of aphids extracted by plot were recorded.

Plots were swathed on July 10, 2009. On July 24 (field BL# 4) and July 25 (field BL#11) individual plots were combined directly into a weigh-wagon to record seed weights that could be converted to seed lbs/acre.After 1st year harvest, a third application of three foliar products was made to site 1; BL#4) on September 28, 2009 as aphids increased in yellow water traps. (Figure 1). 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 (0.10inches) The PRG was greening and had approx. 2 inches of regrowth. These plots were evaluated for aphids on October 8, 2009 at 10-day post application using the soil core and Berlese funnel extraction method.

Results and Discussion

Aphid control. Few to no aphids were seen on seedling grasses through the summer, 2008. First sprays were applied on October 9, 2008 in response to increased aphid numbers in yellow water traps (Figure 3). Second sprays were applied on May 29, 2009 also in response to increased aphid numbers in yellow water traps. Aphid control was evaluated by taking 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 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, 3). By May 28, 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 July 6, 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 September 28, 2009, a 3rd spray was applied to site 1, field BL#4. 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 field BL#11 than of field BL#4, from 4 to 20 times fewer aphids during peak numbers.

Barley yellow dwarf virus control (Table 4). There was a reduction of visual symptoms in treated plots compared to the untreated plots. Field BL#11, site 2 had fewer aphids throughout the year.

Nearly 60% of plants in untreated of field BL#4 expressed BYDV-symptoms compared to 22% of plants for field BL#11. In field BL#4 – the seed treatment, Admire Pro and Baythroid plots had significantly fewer BYDV-infected leaves than the untreated. In field BL#11, none of the plots had statistically fewer infected leaves than in the untreated plots.

Grass seed yields (Table 4 and 5). All treatments increased seed yields in BL#4, from 2 to 8% relative to the untreated as measured by weigh wagon in the field. However these increases were small and not statistically significant. At BL#11 site, 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.

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, BL#4, were re-treated last fall after harvest.

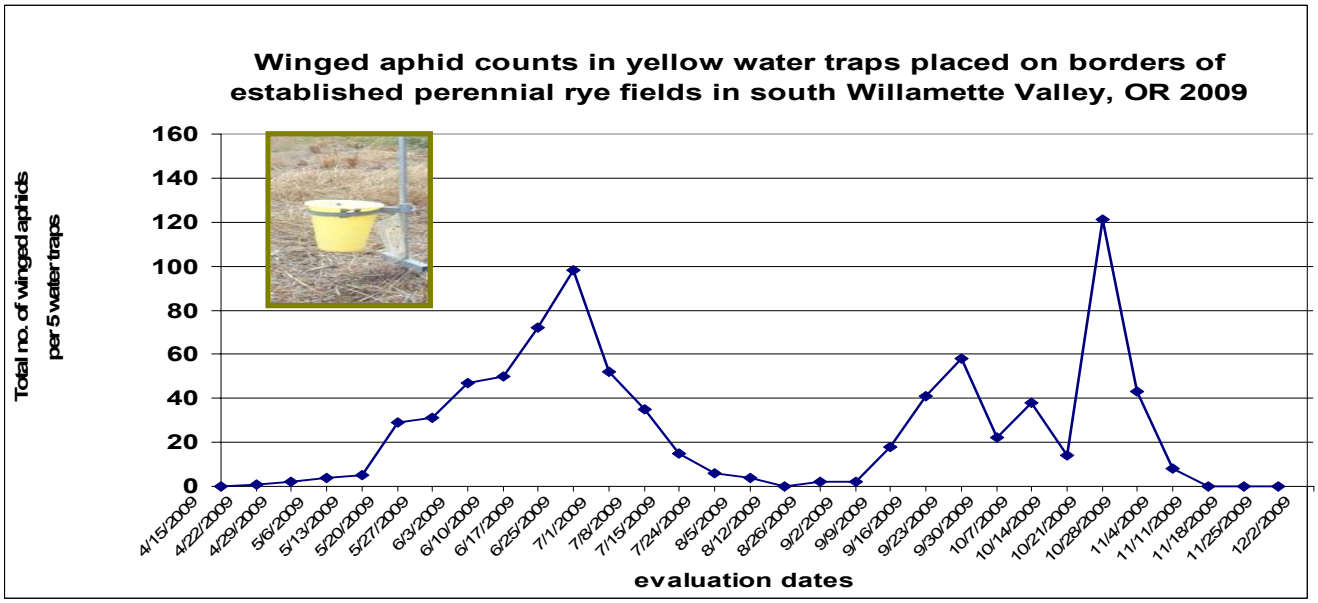

Figure 1. Aphid flight was monitored in 2009 using yellow water traps on borders of PRG fields.

Table 1. Aphid numbers found in treated-plots of PRG, site 1, BL#4 using Berlese funnel extraction.

Treatment[3]	Rate/A	Formulation	Mean (± SE) no. of aphids per five, 6 inch grass cores[1,2]				
			Jan 22, 2009	April 06, 2009	May 28, 2009	July 6, 2009	Oct. 8, 2009
			2nd year perennial rye field (BL#4)				
Admire Pro	8 oz	0.3	1.3 ±1.3b	6.7 ±4.2a	84.3 ±36.6 a	11.0 ±5.7 a	9.3 ±6.4 b
Baythroid XL	2.8 oz	0.022	0b	11.3 ±6.4a	43.3 ±10.8 a	12.7 ±7.7 a	92.3 ±73.3 b
Movento	6 oz	0.093	na	na	na	26.3 ±9.2 a	27.67 ±16.2 b
Untreated check	--		37.7 ±22.0a	288.0 ±130.4a	43.0 ±6.8 a	5.0 ±1.5 a	475 ±98.5 a
F			11.35	2.85	1.05	1.95	7.18
$P < 0.05$			0.0091	0.1345	0.4051	0.2009	0.0117

[1] Means separated using Fishers 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 3x, totaling 15 cores.
3 Field was seeded on May 10, 2008. First, second and third applications were applied on October 29, 2008 (fall 08) May 29, 2009 (spring 09), and September 28th, 2009 (fall 09), respectively. The Movento treatment was not applied until May, 29th.

Table 2. Aphid numbers found in treated-plots of PRG, site 2, BL#11 using Berlese funnel extraction.

Treatment[3]	Rate/A	Formulation	Mean (± SE) no. of aphids per five, 6 inch grass cores[1,2]			
			Jan 22, 2009	April 06, 2009	May 28, 2009[3]	July 6, 2009
			2nd year perennial rye field (BL#11)			
Admire Pro	8 oz	0.3	0.7 ±0.7 a	0.7 ±0.7 b	38.0 ±28.3a	4.5 ±0.5a
Baythroid XL	2.8 oz	0.022	0 b	0b	127.7 ±101.1a	4.7 ±2.7a
Movento	6 oz	0.093	na	na	Na	7.5 ±4.5a
Untreated check			10.7 ±5.8 a	65.3 ±41.7a	76.3 ±15.8a	22.5 ±18.5a
		F	2.02	16.20	0.59	1.09
		$P < 0.05$	0.2137	<0.0038*	0.5837	0.4081

[1] Means separated using Fishers 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 3x, totaling 15 cores.
3 Field was seeded on May 10, 2008. First, second and third applications were applied on October 29, 2008 (fall 08) May 29, 2009 (spring 09), and September 28th, 2009 (fall 09), respectively. The Movento treatment was not applied until May, 29th.

Table 3. Efficacy of gaucho-treated seedAphid numbers found in PRG, site 1, BL#4 using Berlese funnel extraction.

Treatment[1]	Rate/ cwt	Formulation	Mean (± SE) no. of aphids per five, 4-6 inch grass cores[2,3]				
			Jan 22, 2009	April 06, 2009	May 28, 2009[3]	July 6, 2009	Oct. 8, 2009
			Field BL#11				
Gaucho 480-treated seed + Mustang	2oz		0 b	0.33 b ±0.33 b	21.00 ±14.2 a	9.3 a ±2.9 a	111.3 ±36.7 b
Untreated check	--	--	37.7 ±22.0 a	288.0 ±130.4 a	43.0 a ±6.8 a	5.00 a ±1.5 a	475.3 ±98.5 a
F			152.15	23.96	2.37	1.35	12.80
$P < 0.05$			< 0.0002*	<0.0081*	0.198	0.3094	0.0232*

[1]Seed was treated with Imidacloprid (Gaucho 480) at 4 lbs/G and applied to 29.38 acres on May 10, 2008.
[2] Means separated using Fishers 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, 4-6 inch grass cores, replicated 3x, totaling 15 cores

Table 4. 1st year seed yield (lbs per acre) at two sites and visual ratings of BYDV-symptoms.

Treatment	Seed yield (± SEM)[1] lbs. per acre		BYDV-like symptoms rating[3]	
	July 24, 2009	July 25, 2009	June 15,2009	June 15, 2009
	Field BL#4	**Field BL#11**	**Field BL#4**	**Field BL#11**
Admire Pro	2175.3 a ±42.9	2119.7 a ±117.09	37.50 bc ±5.5	18.0 ab ±2.0
Movento	2190.6 a ±102.9	2283.6 a ±109.03	49.5 ab ±6.5	27.0 a ±5.0
Baythroid XL	2143.4 a ±30.3	2237.6 a ±141.72	44.0 bc ±3.0	13.0 b ±2.0
Gaucho480 Seed + Mustang	2074.7 a ± 17.2	Not applicable	34.0 c ±2.0	--
Untreated Check	2028.4 a[2] ±37.2	2152.6 a ±49.47	61.0 a ±0.0	22.5 ab ±1.5
F	0.46	0.47	6.64	4.09
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.

Table 5. Comparison of seed yield increases over untreated PRG plots.

Treatment	Increase in Seed yield over untreated (lbs. per acre)	
	July 24, 2009	July 25, 2009
	Field BL#4 (site 1)	**Field BL#11 (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
Untreated Check	2028.4	2152.6