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Colorado State University

College of Agricultural Sciences

Department of Bioagricultural Sciences and Pest Management

Cooperative Extension

2006 Colorado Field Crop Insect Management Research and Demonstration Trials

2006 Colorado Field Crop Insect Management Research and Demonstration Trials[1]

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CONTROL OF RUSSIAN WHEAT APHID BIOTYPE 2 IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2006

Jeff Rudolph, Terri Randolph, Hayley Miller, Frank Peairs, Betsy Bosley, Sam Gray, Erin Klamper, Linda Stevens, and Emily Tamlich, Department of Bioagricultural Sciences and Pest Management

CONTROL OF RUSSIAN WHEAT APHID BIOTYPE 2 IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2006: Treatments were applied on 2 May 2006 with a 'rickshaw-type' CO_2 powered sprayer calibrated to apply 20 gal/acre at 3 mph and 32 psi through three 8004 (LF4) nozzles mounted on a 5.0 ft boom. Conditions were clear and calm with temperatures of 54°F (start) to 65°F (finish) at the time of treatment. Plots were 6 rows (5.0 ft) by 28.0 ft and were arranged in six replicates of a randomized, complete block design. Crop stage at application was jointing (Zadoks 30). The crop had been infested with greenhouse-reared aphids on 27 February and 27 March, 2006.

Treatments were evaluated by collecting 20 symptomatic tillers along the middle four rows of each plot 7, 14 and 21 days after treatment (DAT). Tiller samples were placed in Berlese funnels for 24 hours to extract aphids into alcohol for counting. Symptomatic tiller samples taken the day before treatment averaged 13.9 ± 13.0 Russian wheat aphids per tiller. Aphid counts transformed by the log +1 method were used for analysis of variance and mean separation by Tukey's HSD test (α=0.05). Original means are presented in Table 1. Total insect days for each treatment were calculated according the method of Ruppel (Journal of Economic Entomology 76: 375-7, 1983) and analyzed in the same manner, with original means presented in Table 1. Reductions in insect days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100).

Aphid pressure was more severe than in past artificially-infested winter wheat experiments, with about 114 aphids/tiller in the untreated control 21 DAT (Table 1). All treatments except Lannate LV, 0.45 lb (AI)/acre, had fewer aphids than the untreated control 7, 14 and 21 DAT. All treatments had fewer aphid days than the untreated control. All three rates of Lorsban 4E and Warrior, 0.03 lb (AI)/acre reduced total aphid days over three weeks by 90%, the level of performance observed by the more effective treatments in past experiments. No phytotoxicity was observed with any treatment.

Field History

Pest:	Russian wheat aphid, *Diuraphis noxia* (Kurdjumov)
Cultivar:	'Akron'
Planting Date:	22 September 2005
Irrigation:	Post planting and 27 April 2006, linear move sprinkler with drop nozzles
Crop History:	Fallow in 2004
Herbicide:	Harmony Extra, 0.5 oz/acre + 2,4-D amine, 0.375 lb (AI)/acre
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Sandy clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (Block 1030 East)

Table 1. Control of Russian wheat aphid with hand-applied insecticides, ARDEC, Fort Collins, CO. 2006.

PRODUCT, LB (AI)/ACRE	APHIDS PER TILLER ± SE[1] 7 DAT	14 DAT	21 DAT	TOTAL APHID DAYS PER TILLER ± SE[1]	% REDUCTION IN APHID DAYS[2]
Lorsban 4E, 0.38	1.0 ± 0.3 D	0.6 ± 0.2 C	2.1 ± 0.5 E	66.9 ± 2.8 D	92
Warrior, 0.03	0.8 ± 0.1 CD	0.6 ± 0.3 C	3.0 ± 1.3 E	68.9 ± 4.0 D	92
Lorsban 4E, 0.5	0.8 ± 0.1 CD	0.5 ± 0.1 C	3.3 ± 1.0 DE	69.4 ± 3.6 D	92
Lorsban 4E, 0.25	1,0 ± 0.2 CD	1.0 ± 0.4 C	3.2 ± 1.1 CDE	73.6 ± 3.3 D	91
Warrior, 0.01	1.5 ± 0.6 CD	1.7 ± 0.5 C	9.8 ± 4.5 CDE	105.2 ± 17.8 CD	87
Mustang Max 0.8 E, 0.025	1.5 ± 0.3 CD	3.0 ± 1.6 C	9.6 ± 3.6 BCDE	114.2 ± 18.4 CD	86
Baythroid XL, 0.022	1.5 ± 0.3 CD	2.7 ± 0.7 BC	14.6 ± 4.7 BCD	129.2 ± 12.5 C	84
Dimethoate 4E 0.38	2.6 ± 0.8 BC	1.6 ± 0.2 C	18.4 ± 4.7 BC	142.0 ± 14.3 C	83
Mustang Max 0.8 E, 0.02	1.5 ± 0.4 CD	2.8 ± 1.0 BC	18.6 ± 6.4 BCD	144.1 ± 27.8 C	83
Lannate LV, 0.45	6.3 ± 0.8 AB	10.9 ± 2.0 AB	48.2 ± 8.3 AB	337.7 ± 42.9 B	59
Untreated control	18.1 ± 2.4 A	36.3 ± 7.7 A	114.0 ± 15.9 A	828.4 ± 117.0 A	—
F Value	17.82	14.14	12.17	46.56	—
p > F	<0.0001	<0.0001	<0.0001	<0.0001	—

[1]SE, standard error of the mean. Means in the same column followed by the same letters(s) are not statistically different, Tukey's HSD (∝=0.05).
[2]% reduction in total aphid days per tiller, calculated by the Ruppel method.

CONTROL OF RUSSIAN WHEAT APHID BIOTYPE 2 IN SPRING BARLEY WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2006

Jeff Rudolph, Terri Randolph, Hayley Miller, Frank Peairs, Betsy Bosley, Sam Gray, Erin Klamper, Linda Stevens, and Emily Tamlich, Department of Bioagricultural Sciences and Pest Management

CONTROL OF RUSSIAN WHEAT APHID BIOTYPE 2 IN SPRING BARLEY WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2006: Treatments were applied on 12 May 2006 with a 'rickshaw-type' CO_2 powered sprayer calibrated to apply 20 gal/acre at 3 mph and 32 psi through three 8004 (LF4) nozzles mounted on a 5.0 ft boom. Conditions were clear and calm with temperatures of 54°F (start) to 65°F (finish) at the time of treatment. The second Lannate treatment was applied on 17 May 2006. The same sprayer was used, and conditions were clear, calm, and 70°F. Plots were 6 rows (5.0 ft) by 28.0 ft and were arranged in six replicates of a randomized, complete block design. Crop stage at application was 4 leaf (Zadoks 14). The crop had been infested with greenhouse-reared aphids on 12 April 2006.

Treatments were evaluated by collecting 20 symptomatic tillers along the middle four rows of each plot 7, 14 and 21 days after treatment (DAT). Tiller samples were placed in Berlese funnels for 24 hours to extract aphids into alcohol for counting. Symptomatic tiller samples taken the day before treatment averaged 10.5 ± 2.3 Russian wheat aphids per tiller. Aphid counts were subjected to analysis of variance and mean separation by Tukey's HSD test (α=0.05). Aphid counts at 21 DAT were transformed by the log +1 method prior to analysis. Original means are presented in the tables. Total insect days for each treatment were calculated according the method of Ruppel (Journal of Economic Entomology 76: 375-7, 1983) and analyzed in the same manner, with original means presented in Table 2. Reductions in insect days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100).

Aphid pressure was as severe as in past artificially-infested spring barley experiments, with about 184 aphids/tiller in the untreated control 21 DAT (Table 2). The Lorsban 4E-SG, 0.5 lb (AI)/acre, Lannate LV, 0.45 lb (AI)/acre applied twice, and Warrior, 0.03 lb (AI)/acre treatments had fewer aphids than the untreated control 7, 14 and 21 DAT. All treatments had fewer aphid days than the untreated control. No treatment provided 90% reduction in aphid days, which is considered good control of Russian wheat aphid in winter wheat. No phytotoxicity was observed with any treatment.

Field History

Pest:	Russian wheat aphid, *Diuraphis noxia* (Kurdjumov)
Cultivar:	'Baroness'
Planting Date:	16 March 2006
Irrigation:	Post planting, linear move sprinkler with drop nozzles
Crop History:	Corn in 2005
Herbicide:	Harmony Extra, 0.5 oz/acre + 2,4-D 16 oz product/acre
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Sandy clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (south end of Block 1080)

Table 2. Control of Russian wheat aphid in spring barley with hand-applied insecticides, ARDEC, Fort Collins, CO. 2006.

PRODUCT, LB (AI)/ACRE	APHIDS PER TILLER ± SE[1] 7 DAT	14 DAT	21 DAT	TOTAL APHID DAYS PER TILLER ± SE[1]	% REDUCTION IN APHID DAYS[2]
Lorsban 4E-SG, 0.5	4.8 ± 1.9 D	6.7 ± 1.1 D	36.3 ± 6.1 C	244.8 ± 32.6 D	83
Lannate LV, 0.45, repeat at 5 DAT	19.5 ± 3.0 BC	23.7 ± 1.7 CD	63.1 ± 10.1 BC	560.8 ± 58.2 CD	60
Warrior, 0.03	9.4 ± 2.0 CD	45.8 ± 6.4 BC	77.0 ± 16.5 B	692.7 ± 100.8 BC	51
Mustang Max 0.8 E, 0.025	22.8 ± 3.3 AB	64.9 ± 6.6 AB	110.7 ± 10.6 AB	1038.2 ± 43.9 AB	27
Baythroid XL, 0.022	24.5 ± 3.1 AB	64.0 ± 6.2 AB	139.3 ± 12.6 A	1144.2 ± 50.0 A	19
Lannate LV, 0.45	25.1 ± 2.8 AB	61.0 ± 3.8 AB	161.9 ± 14.5 A	1206.5 ± 75.1 A	15
Untreated control	32.0 ± 2.3 A	73.5 ± 8.4 A	183.6 ± 44.7 A	1417.6 ± 203.6 A	—
F Value	12.97	22.94	18.65	22.42	—
p > F	<0.0001	<0.0001	<0.0001	<0.0001	—

[1]SE, standard error of the mean. Means in the same column followed by the same letters(s) are not statistically different, Tukey's HSD ($\propto$=0.05).
[2]% reduction in total aphid days per tiller, calculated by the Ruppel method.

CONTROL OF ALFALFA INSECTS IN ALFALFA WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2006

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CONTROL OF ALFALFA INSECTS IN ALFALFA WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2006: Early treatments were applied on 20 April 2006 with a 'rickshaw-type' CO_2 powered sprayer calibrated to apply 20 gal/acre at 3 mph and 30 psi through six XR8002VS nozzles mounted on a 10.0 ft boom. Early treatments were made approximately when army cutworm treatments are applied in the region. This was done to determine the effect of army cutworm treatment in alfalfa on subsequent alfalfa weevil larval densities. All other treatments were applied in the same manner on 12 May 2006. Conditions were 0-10% cloud cover with calm winds with temperatures of 52 - 58°F at the time of early treatments. Conditions were clear with calm winds and temperatures of 60-70°F at the time of the later treatments. Plots were 10.0 ft by 25.0 ft and arranged in four replicates of a randomized, complete block design. Untreated control and Baythroid XL, 0.022 lb (AI)/acre, plots were replicated eight times for a more accurate comparison of treatment effects on yield (insect counts from four plots of each treatment were included in the analyses described below). The crop was four inches in height at the time of early treatments. Crop height at the time of late treatments was 2.0 ft.

Treatments were evaluated by taking ten 180° sweeps per plot with a standard 15 inch diameter insect net 7, 14 and 21 days after the later treatments (DAT). Alfalfa weevil larvae, alfalfa weevil adults and pea aphids were counted. A pretreatment sample was taken two days prior to the later treatments by taking 200, 180° sweeps across the experimental area. This sample averaged 9.4 and 3.2 alfalfa weevil larvae and pea aphids per sweep, respectively. Alfalfa weevil counts transformed by the log + 1 method were used for analysis of variance and mean separation by Tukey's HSD procedure (α=0.05). Alfalfa weevil adults counts were transformed by the square root + 0.5 method, and pea aphid counts were not transformed. Original means are presented in the tables. Yields were taken in the Baythroid XL, 0.022 lb (AI)/acre, and untreated control plots on 5 June 2006 with a Carter forage harvester. Yields were converted to tons per acre adjusted by subsample moisture. Treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (α=0.05).

Alfalfa weevil larval densities were similar to previous years, while pea aphid abundance 21 DAT was greater than observed in 2005. All treatments had fewer alfalfa weevil larvae than the untreated control 7, 14 and 21 DAT except for Steward EC, 0.065 lb (AI)/acre (Table 3). No treatment had fewer alfalfa weevil adults than the untreated control at any evaluation date (Table 4). No treatment had fewer pea aphids that the untreated control at 7 and 21 DAT. The early Baythroid XL treatment had more pea aphids that the untreated control at 7 DAT. The Warrior 1E, 0.03 lb (AI)/acre, Furadan 4F, 0.50 + Dimethoate 4E, 0.25 0.03 lb (AI)/acre, Lorsban 4F, 0.75 0.03 lb (AI)/acre, and Baythroid XL + Lorsban 4E, 0.0155 + 0.25 0.03 lb (AI)/acre, treatments had fewer pea aphids than the untreated control at 14 DAT (Table 5). No phytotoxicity was observed with any treatment. The plots treated with Baythroid XL, 0.022 lb (AI)/acre, yielded 1.86 tons/acre, 20.4% more than the untreated plots which yielded 1.48 tons/acre. The difference was significant (paired t-test, t=-1.94, df=6, $p(t>t_{0.05})$=0.0001). Yield reduction measured since 1995 has averaged 8.2%, with a range of 0.0% to 20.9%.

Field History

Pests:	Alfalfa weevil, *Hypera postica* (Gyllenhal)
	Pea aphid, *Acyrthosiphon pisum* (Harris)
Cultivar:	Unknown
Plant Stand:	Thin, dry conditions
Irrigation:	Linear move sprinkler with drop nozzles
Crop History:	Alfalfa since 2002
Herbicide:	None
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Sandy clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO, 80524 (Block 1060 south)

Table 3. Control of alfalfa weevil larvae, ARDEC, Fort Collins, CO, 2006.

PRODUCT, LB (AI)/ACRE	ALFALFA WEEVIL LARVAE PER SWEEP ± SEM[1]		
	7 DAT	14 DAT	21 DAT
Warrior 1E, 0.03	0.8 ± 0.1 CD	0.9 ± 0.4 DEF	0.2 ± 0.1 F
Baythroid XL, 0.0155	0.6 ± 0.3 CD	0.8 ± 0.3 DEF	0.3 ± 0.1 F
Warrior 1E, 0.02, early	1.7 ± 0.7 BCD	0.9 ± 0.3 DEF	0.4 ± 0.1 F
Mustang Max 0.8EC, 0.025	0.4 ± 0.3 D	0.7 ± 0.1 DEF	0.5 ± 0.2 F
Baythroid XL, 0.0125	1.1 ± 0.2 CD	1.0 ± 0.1 DEF	0.6 ± 0.3 F
Warrior 1E, 0.02	0.5 ± 0.1 CD	0.7 ± 0.3 DEF	0.6 ± 0.1 F
Baythroid XL, 0.022	0.8 ± 0.2 CD	1.8 ± 2.4 DEF	0.7 ± 0.2 EF
Mustang Max 0.8EC, 0.025, early	1.2 ± 0.2 CD	1.5 ± 0.8 DEF	0.8 ± 0.3 DEF
Furadan 4F, 0.50 + Dimethoate 4E, 0.25	0.8 ± 0.2 CD	0.5 ± 0.2 EF	0.9 ± 0.2 DEF
Baythroid XL + Lorsban 4E, 0.0155 + 0.25	0.7 ± 0.1 CD	0.8 ± 0.1 DEF	1.1 ± 0.3 DEF
Furadan 4F, 0.50	0.8 ± 0.4 CD	0.3 ± 0.1 F	1.5 ± 0.8 DEF
Baythroid XL, 0.0125, early	3.1 ± 1.1 BC	3.3 ± 1.2 CDE	2.9 ± 0.6 CDE
Furadan 4F, 0.25	0.5 ± 0.2 CD	1.1 ± 0.2 DEF	3.0 ± 0.6 CD
Lorsban 4F, 0.75	0.8 ± 0.2 CD	3.5 ± 0.2 CD	4.2 ± 0.3 BC
Steward EC, 0.065	2.7 ± 0.4 BC	9.2 ± 2.5 BC	9.9 ± 2.6 AB
Untreated control	9.7 ± 2.7 A	29.8 ± 8.4 A	21.3 ± 6.4 A
F value	9.04	22.09	32.12
p>F	<0.0001	<0.0001	<0.0001

[1]SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not statistically different, Tukey's HSD (α=0.05).

Table 4. Control of alfalfa weevil adults, ARDEC, Fort Collins, CO, 2006.

PRODUCT, LB (AI)/ACRE	ALFALFA WEEVIL ADULTS PER SWEEP ± SEM[1]		
	7 DAT	14 DAT	21 DAT
Baythroid XL, 0.0125	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.1
Baythroid XL, 0.022	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0
Baythroid XL, 0.0155	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0
Baythroid XL + Lorsban 4E, 0.0155 + 0.25	0.3 ± 0.3	0.1 ± 0.0	0.0 ± 0.0
Baythroid XL, 0.0125, early	0.0 ± 0.0	0.1 ± 0.0	0.1 ± 0.0
Furadan 4F, 0.25	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0
Furadan 4F, 0.50	0.0 ± 0.0	0.1 ± 0.0	0.1 ± 0.1
Furadan 4F, 0.50 + dimethoate 4E, 0.25	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
Lorsban 4F, 0.75	0.0 ± 0.0	0.1 ± 0.0	0.2 ± 0.1
Mustang Max 0.8EC, 0.025	0.0 ± 0.0	0.1 ± 0.1	0.2 ± 0.1
Mustang Max 0.8EC, 0.025, early	0.0 ± 0.0	0.1 ± 0.0	0.1 ± 0.0
Steward EC, 0.065	0.0 ± 0.0	0.1 ± 0.1	0.1 ± 0.0
Warrior 1E, 0.02	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0
Warrior 1E, 0.02, early	0.1 ± 0.1	0.1 ± 0.0	0.1 ± 0.1
Warrior 1E, 0.03	0.0 ± 0.0	0.0 ± 0.0	0.1 ± 0.0
Untreated control	0.0 ± 0.0	0.1 ± 0.0	0.1 ± 0.0
F value	1.13	0.69	0.79
p>F	0.3567	0.7757	0.6838

[1]SEM, standard error of the mean.

Table 5. Control of pea aphids in alfalfa, ARDEC, Fort Collins, CO, 2006.

PRODUCT, LB (AI)/ACRE	PEA APHID PER SWEEP ± SEM[1]		
	7 DAT	14 DAT	21 DAT
Warrior 1E, 0.03	1.1 ± 0.1 CD	4.5 ± 0.8 DEF	24.5 ± 3.3 B
Furadan 4F, 0.50 + Dimethoate 4E, 0.25	0.5 ± 0.2 CD	2.0 ± 1.0 F	25.0 ± 1.7 B
Lorsban 4F, 0.75	0.2 ± 0.1 D	2.4 ± 0.8 F	25.7 ± 2.3 B
Baythroid XL + Lorsban 4E, 0.0155 + 0.25	0.4 ± 0.3 CD	4.1 ± 2.3 EF	34.1 ± 5.0 B
Baythroid XL, 0.022	3.0 ± 0.4 BCD	10.1 ± 1.8 BCDEF	43.0 ± 6.1 AB
Warrior 1E, 0.02	1.4 ± 0.5 CD	6.8 ± 2.0 CDEF	43.4 ± 7.3 AB
Furadan 4F, 0.50	1.9 ± 0.3 CD	6.1 ± 2.0 CDEF	44.2 ± 4.9 AB
Baythroid XL, 0.0125	3.4 ± 0.7 BCD	9.7 ± 2.3 BCDEF	51.5 ± 3.6 AB
Steward EC, 0.065	2.7 ± 0.7 CD	12.4 ± 3.5 BCDEF	53.9 ± 12.1 AB
Furadan 4F, 0.25	2.9 ± 1.5 BCD	9.5 ± 1.6 BCDEF	57.2 ± 9.9 AB
Untreated control	3.6 ± 0.7 BCD	13.9 ± 0.8 ABC	58.7 ± 16.9 AB
Mustang Max 0.8EC, 0.025	1.8 ± 0.3 CD	9.4 ± 2.6 BCDEF	58.7 ± 4.0 AB
Baythroid XL, 0.0155	3.4 ± 1.0 BCD	12.2 ± 1.9 BCDE	58.7 ± 12.0 AB
Mustang Max 0.8EC, 0.025, early	6.9 ± 1.3 AB	17.1 ± 1.7 AB	63.5 ± 13.5 AB
Baythroid XL, 0.0125, early	8.9 ± 1.4 A	22.0 ± 2.4 A	77.0 ± 7.3 AB
Warrior 1E, 0.02, early	4.5 ± 1.4 BC	20.7 ± 2.0 A	80.5 ± 11.3 AB
F value	8.23	14.24	4.18
p>F	<0.0001	<0.0001	0.0001

[1]SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not statistically different, Tukey's HSD (α=0.05).

CONTROL OF WESTERN CORN ROOTWORM WITH CONVENTIONAL INSECTICIDES IN CORN, ARDEC, FORT COLLINS, CO, 2006

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CONTROL OF WESTERN CORN ROOTWORM IN CORN, ARDEC, FORT COLLINS, CO, 2006: All treatments were planted on 11 May 2006. Granular insecticides were applied with modified Wintersteiger meters mounted on a two-row John Deere Maxi-Merge planter. T-band granular applications were applied with a 4-inch John Deere spreader located between the disk openers and the press wheel. Plots were one 25-ft row arranged in six replicates of a randomized complete block design.

Treatments were evaluated by digging three plants per plot on 12 July 2006. The roots were washed and the damage rated on the Iowa 1-6 scale (Witkowski, J.F., D.L. Keith and Z.B. Mayo. 1982. Evaluating corn rootworm soil insecticide performance. University of Nebraska Cooperative Extension NebGuide G82-597, 2 pp.) Plot means were used for analysis of variance and mean separation by Tukey's HSD method (α=0.05). Treatment efficiency was determined as the percentage of total plants per treatment having a root rating of 3.0 or lower.

Western corn rootworm pressure was low, with the untreated control rating 3.1 as compared to 4.4 in 2005. Low root ratings were likely due to early rootworm hatch in response to warm soils and late, uneven germination because of extremely dry conditions at planting. Force 3G, 5 oz, Poncho 1.25/kernel, and the Poncho + Aztec combinations had lower root ratings that the untreated control. No phytotoxicity was observed with any treatment.

Field History

Pest:	Western corn rootworm, *Diabrotica virgifera virgifera* LeConte
Cultivar:	Garst 8802RR
Planting Date:	11 May 2006
Plant Population:	28,700
Irrigation:	furrow
Crop History:	Corn in 2001-2004
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (northern Block 3100)

Table 6. Control of western corn rootworm with planting and seed treatments, ARDEC, Fort Collins, 2006

PRODUCT, OZ/1000 ROW FT[3]	ROOT RATING[1]	EFFICIENCY[2]
Force 3G, 5 oz	2.1 B	100
Poncho 0.25/kernel + Aztec 2.1G 6.7 oz	2.1 B	100
Poncho 1.25/kernel	2.1 B	100
Poncho 1.25/kernel + Aztec 2.1G 6.7 oz	2.2 B	94
Aztec 2.1G, 6.7 oz	2.3 AB	100
Cruiser 1.25/kernel	2.4 AB	100
Counter 15G, 8 oz	2.5 AB	94
Lorsban 15G, 8 oz	2.9 AB	72
Untreated control	3.1 A	67
F Value	4.31	---
p > F	0.0008	---

[1]Iowa 1-6 rootworm damage scale. Means followed by the same letter(s) are not statistically different, Tukey's HSD (α=0.05).
[2]Percentage of 18 plants (total in 6 replicates of a treatment) with a rating of 3.0 or less.
[3]Seed treatment rates given in active ingredient (mg) per seed

CONTROL OF WESTERN CORN ROOTWORM WITH THE MIR604 EVENT, SOIL INSECTICIDES, AND SEED TREATMENTS, ARDEC, FORT COLLINS, 2006

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CONTROL OF WESTERN CORN ROOTWORM WITH THE MIR604 EVENT, SOIL INSECTICIDES, AND SEED TREATMENTS, ARDEC, FORT COLLINS, 2006: All treatments were planted on 11 May 2006. Granular insecticides were applied with modified Wintersteiger meters mounted on a two-row John Deere Maxi-Merge planter. T-band granular applications were applied with a 4-inch John Deere spreader located between the disk openers and the press wheel. Plots were one 25-ft row arranged in four replicates of a randomized complete block design.

Treatments were evaluated by digging five plants per plot on 12 July 2006. The roots were washed and the damage rated on the Iowa 1-6 scale (Witkowski, J.F., D.L. Keith and Z.B. Mayo. 1982. Evaluating corn rootworm soil insecticide performance. University of Nebraska Cooperative Extension NebGuide G82-597, 2 pp.) Plot means were used for analysis of variance and mean separation by Tukey's HSD method (α=0.05). Treatment efficiency was determined as the percentage of total plants per treatment having a root rating of 3.0 or lower.

Western corn rootworm pressure was low, with the untreated control rating 3.6 as compared to 4.4 in 2005. Low root ratings were likely due to early rootworm hatch in response to warm soils and late, uneven germination because of extremely dry conditions at planting. All treatments had less damage than the untreated control, and there were no differences among treatments. No phytotoxicity was observed with any treatment.

Field History

Pest:	Western corn rootworm, *Diabrotica virgifera virgifera* LeConte
Cultivar:	Experimental
Planting Date:	11 May 2006
Plant Population:	28,700
Irrigation:	furrow
Crop History:	Corn in 2001-2004
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (northern Block 3100)

Table 7. Control of western corn rootworm with the MIR604 event, soil insecticides, and seed treatments, ARDEC, Fort Collins, 2006

PRODUCT, OZ/1000 ROW FT[3]	ROOT RATING[1]	EFFICIENCY[2]
MIR604	2.0 B	100
Aztec 2.1G, 6.7 oz (nonMIR604)	2.1 B	100
MIR604 + Cruiser 1.25/kernel	2.1 B	100
Poncho 1.25/kernel (nonMIR604)	2.2 B	100
Cruiser 1.25/kernel (nonMIR604)	2.2 B	100
Force 3G, 5 oz (nonMIR604)	2.2 B	100
Lorsban 15G, 8 oz (nonMIR604)	2.5 B	90
Untreated control (nonMIR604)	3.6 A	35
F Value	17.92	---
p > F	<0.0001	---

[1]Iowa 1-6 rootworm damage scale. Means followed by the same letter(s) are not statistically different, Tukey's HSD (α=0.05).
[2]Percentage of 20 plants (total in 4 replicates of a treatment) with a rating of 3.0 or less.
[3]Seed treatment rates given in active ingredient (mg) per seed

INFESTATION METHODS FOR WESTERN BEAN CUTWORM IN FIELD CORN, ARDEC, FORT COLLINS, CO, 2006

Frank Peairs, Terri Randolph, Jeff Rudolph, and Linda Stevens, Department of Bioagricultural Sciences and Pest Management

INFESTATION METHODS FOR WESTERN BEAN CUTWORM IN FIELD CORN, ARDEC, FORT COLLINS, CO, 2006: The planting dates for the infestation methods experiment and the infestation levels experiments were 9 and 17 May 2006, respectively. The infestation methods experiment was infested on 20 July 2006, except for the ear infestation. Tassels were infested by placing egg masses or larvae between the tassel and the unextended flag leaf. The ear infestation was accomplished on 24 July 2006 by using a Davis insect inoculator (Davis, F. M. and T. G. Oswalt. 1979. Hand inoculator for dispensing lepidopterous insects. Agricultural Research [Southern Region], Science and Education Administration, USDA, New Orleans, LA. Southern Series 9) to place approximately 20 neonate larvae in the ear leaf axil. Plants were approximately 60% silked at the time of this treatment. The infestation levels experiment was infested on 31 July 2006 using the Davis inoculator. The 1X rate was three larvae per ear placed on the silks. The 2X rate had three more larvae placed in the ear leaf axil, and the 3X rate had three additional larvae placed between the ear and the stalk. The plots in the infestation methods experiment were five consecutive plants arranged in four replicates of a randomized complete block design. Plots for the infestation levels experiment were three consecutive plants arranged in three replicates of a randomized complete block design.

Treatments were evaluated on 30 August 2006 by opening the husks of the primary ear of each of the infested plants and counting damaged ears and larvae. Plot means were used for analysis of variance and mean separation by Tukey's HSD method (α=0.05). Damaged ear counts in the infestation methods experiment were transformed by the square root + 0.5 method prior to analysis. Treatment means are expressed as percentage damaged ears and total larvae per plot.

All infestation methods resulted in damaged ears, but few larvae were recovered. There was significant bird damage to the infested ears, making evaluation difficult. It is likely that many larvae were lost to bird predation. Increasing egg masses per plant did not increase the amount of damage or larval density. Infestations with the Davis inoculator were equivalent to egg mass infestations, even with as few as three larvae per ear. The uniformity and severity of infestation may be increased through better timing, repeated infestations, and protection from birds.

Field History

Pest:	Western bean cutworm, *Striacosta albicosta* (Smith)
Cultivar:	Garst 8802RR
Planting Date:	9 and 17 May 2006
Plant Population:	28,700
Irrigation:	Linear move sprinkler
Crop History:	Spring barley in 2005
Insecticide:	None prior to experiment
Fertilization:	100 lb N
Soil Type:	Clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (northern Block 1080)

Table 8. Percentage damaged ears and total larvae in five ears resulting from different methods of infesting with eggs and larvae of western bean cutworm, ARDEC, Fort Collins, CO, 2006.

INFESTATION METHOD	% DAMAGED EARS[1]	TOTAL LARVAE
One egg mass on alternating plants	50 A	0.8
Two egg masses per plant	35 AB	1.0
Davis inoculator (20 larvae) in ear	30 AB	1.0
One egg mass per plant	30 AB	0.5
Davis inoculator (20 larvae) in tassel	25 AB	0.0
Uninfested	0 B	0.0
F value	2.44	1.28
p > F	0.0828	0.3215

[1]Means in this column followed by the same letters(s) are not statistically different, Tukey's HSD ($\propto$=0.05).

Table 9. Percentage damaged ears and total larvae in three ears resulting from different infestation levels of western bean cutworm larvae applied with a Davis inoculator, ARDEC, Fort Collins, CO, 2006.

INFESTATION RATE[1]	% DAMAGED EARS	LARVAE
0X	0	0.0
1X	43	0.7
2X	23	0.7
3X	57	0.7
F value	1.69	1.33
p > F	2.682	0.3486

[1]1X, three larvae applied to ear; 2X, six larvae applied to ear; 3X, nine larvae applied to ear.

CONTROL OF SPIDER MITES IN CORN WITH HAND-APPLIED INSECTICIDES AND MITICIDES, ARDEC, FORT COLLINS, CO, 2006

Terri Randolph, Jeff Rudolph, Frank Peairs, Betsy Bosley, Erin Klamper, Linda Stevens, Emily Tamlich, Jake Walker, and Aubrey Wieland, Department of Bioagricultural Sciences and Pest Management

CONTROL OF SPIDER MITES IN CORN WITH HAND-APPLIED INSECTICIDES AND MITICIDES, ARDEC, FORT COLLINS, CO, 2006: Early treatments were applied on 3 August 2006 using a 2 row boom sprayer mounted on a backpack calibrated to deliver 17.8 gal/acre at 32 psi with three XR8002VS nozzles. All other treatments were applied in the same manner on 15 August 2006. Conditions were 15% cloud cover, calm winds and 69 - 78°F temperature at the time of early treatments. Conditions were light fog, calm winds and 65 - 75°F temperature at the time of late treatments. Early treatments were applied at tassel emergence and late treatments were applied at the end of pollen shed. Plots were 25 ft by two rows (30 inch centers) and were arranged in six replicates of a randomized complete block design. Plots were separated from neighboring plots by a single buffer row. Plots were infested on 27 June 2006 by laying mite infested corn leaves, collected earlier that day in Mesa County, CO, across the corn plants on which mites were to be counted. On 30 June 2006, the experimental area was treated with Baythroid XL, 1.6 fl. oz./acre to control beneficial insects and promote spider mite abundance.

Treatments were evaluated by collecting three leaves (ear leaf, 2nd leaf above the ear, 2nd leaf below the ear) from two plants per plot 1 day prior and 7, 14 and 21 days after the later treatment (DAT). Corn leaves were placed in Berlese funnels for 48 hours to extract mites into alcohol for counting. All extracted mites were counted including males and juveniles. Mite counts and mite days (calculated by the method of Ruppel, J. Econ. Entomol. 76: 375-377) were transformed by the square root + 0.5 method prior to analysis of variance and means separation by the Tukey's HSD method (=0.05). Reductions in mite days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100) using the average accumulated mite days of the two untreated controls. Original mite counts for 0, 7, 14 and 21 DAT and mite days accumulated at 21 DAT are presented in Table 10.

Mite densities were moderate and similar to the previous two seasons. Banks grass mite was the predominant species. One untreated control had numerically fewer (42%) accumulated mite days than the other. Onager 1E, 0.094 (early), Oberon 4SC + dimethoate 4E, 0.135 + 0.50, Oberon 4SC, 0.09 (early), Oberon 4SC, 0.135 (early), Comite II 6E + Dimethoate 4E, 1.69 + 0.50, Capture 2E + dimethoate 4E, 0.08 + 0.50, Agri-Mek 0.15, 0.0188 (16 oz/a), Acramite 4SC, 0.75 (early), Fanfare 2E + dimethoate 4E, 0.08 + 0.50, Comite II, 2.54, Zeal 72W + Comite, 1 oz product + 1.64 (early), Zeal 72W, 1 oz product (early), Acramite 4SC, 0.50 (early), and Furadan 4F + dimethoate 4E, 1.00 + 0.50 and had fewer accumulated mite days than the more heavily infested untreated control (Table 10).

Severe phytotoxicity was observed for Acramite treatments. The water for these treatments was buffered to pH 6.5. Laboratory analysis of the buffered water revealed that revealed that the pH was substantially lower than the target level, suggesting that the phytotoxicity was due to water pH rather than the Acramite. Phytotoxicity also was observed in the first plot of the Comite II, 2.54, (early), treatment which was applied immediately after the third Acramite treatment, suggesting the presence of some buffered spray water in sprayer.

Field History:

Pest:	Banks grass mite, *Oligonychus pratensis* (Banks) Twospotted spider mite, *Tetranychus urticae* Koch
Cultivar:	Garst ‘8802' RR
Planting Date:	17 May 2006
Plant Population:	30,000
Irrigation:	Furrow
Crop History:	Continuous corn since 2001
Herbicide:	Roundup UltraMax, 23 fl.oz./acre + 1% ammonium sulphate on 22 June 2005
Fertilization:	100 N
Soil Type:	Clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (Block 3100, north end)

Table 10. Control of corn spider mites with hand-applied insecticides, ARDEC, Fort Collins, CO. 2006.

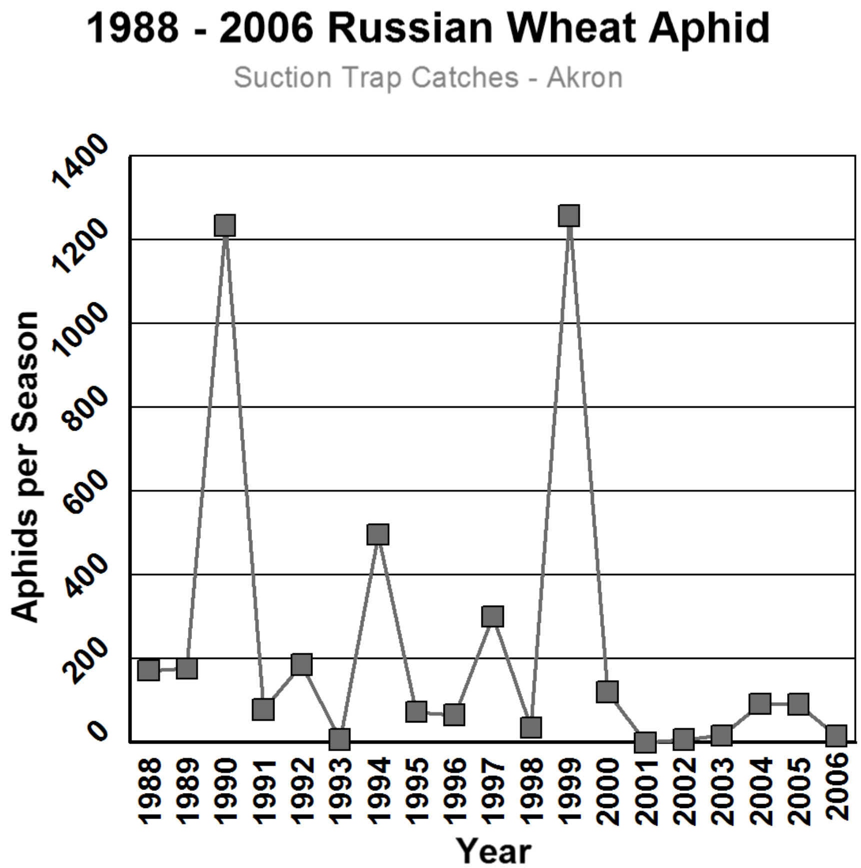
PRODUCT, LB (AI)/ACRE	MITES PER LEAF ± SEM[1] 0 DAT	7 DAT	14 DAT	21 DAT	MITE DAYS ± SEM[1,2]	% REDUCTION IN MITE DAYS
Onager 1E, 0.094 (early)	15.2 ± 4.5	3.8 ± 0.9 B	9.8 ± 2.6 B	10.2 ± 2.7 B	184.3 ± 36.5 B	90
Oberon 4SC + dimethoate 4E, 0.135 + 0.50	22.3 ± 4.7	2.0 ± 0.9 B	10.0 ± 3.8 B	9.2 ± 2.5 B	194.3 ± 44.2 B	89
Oberon 4SC, 0.09 (early)	5.3 ± 1.2	5.8 ± 2.1 B	18.7 ± 7.9 B	16.5 ± 6.8 B	247.9 ± 71.8 B	86
Oberon 4SC, 0.135 (early)	24.3 ± 9.2	6.2 ± 2.4 B	16.5 ± 3.6 B	13.7 ± 4.4 B	291.7 ± 81.1 B	84
Comite II 6E + Dimethoate 4E, 1.69 + 0.50	17.0 ± 5.4	5.5 ± 1.8 B	15.2 ± 5.3 B	26.8 ± 16.2 AB	298.1 ± 76.1 B	83
Capture 2E + Dimethoate 4E, 0.08 + 0.50	27.3 ± 4.9	17.8 ± 11.9 AB	7.8 ± 1.9 B	14.7 ± 3.8 B	326.7 ± 110.4 B	82
Agri-Mek 0.15, 0.0188 (16 oz/a)	30.8 ± 3.4	7.7 ± 2.8 B	15.3 ± 7.1 B	18.2 ± 3.2 AB	332.5 ± 55.0 B	82
Acramite 4SC, 0.75 (early)	23.7 ± 6.3	6.5 ± 1.7 B	22.5 ± 6.9 B	19.3 ± 4.1 AB	353.5 ± 51.8 B	80
Fanfare 2E + Dimethoate 4E, 0.08 + 0.50	37.5 ± 14.1	3.0 ± 1.3 B	21.7 ± 12.1 B	16.7 ± 6.2 B	362.3 ± 130.4 B	80
Comite II, 2.54	18.3 ± 4.1	7.0 ± 2.6 B	30.3 ± 10.4 B	20.2 ± 8.2 AB	396.1 ± 110.4 B	78
Zeal 72W + Comite, 1 oz product + 1.64 (early)	20.2 ± 7.5	13.0 ± 5.8 AB	23.7 ± 11.5 B	24.2 ± 10.9 AB	411.8 ± 128.5 B	77
Zeal 72W, 1 oz product (early)	32.3 ± 7.9	12.3 ± 6.8 AB	32.5 ± 19.0 B	21.2 ± 13.2 AB	501.1 ± 248.9 B	72
Acramite 4SC, 0.50 (early)	17.8 ± 4.6	20.2 ± 9.8 AB	28.8 ± 9.8 B	33.3 ± 13.2 AB	522.1 ± 166.0 B	71
Furadan 4F + Dimethoate 4E, 1.00 + 0.50	43.3 ± 15.4	2.0 ± 0.7 B	34.2 ± 17.4 B	37.8 ± 16.7 AB	537.3 ± 157.4 B	70
Acramite 4SC. 0.375 (early)	22.2 ± 8.2	27.7 ± 14.0 AB	28.2 ± 8.7 B	25.0 ± 7.8 AB	555.9 ± 130.9 AB	69
Comite II 6E, 1.69	49.0 ± 16.2	20.3 ± 7.6 AB	22.5 ± 8.0 B	73.0 ± 53.0 AB	726.8 ± 226.2 AB	60
Fanfare 2E, 0.08	48.2 ± 26.8	13.7 ± 7.2 AB	50.0 ± 23.8 AB	60.8 ± 23.2 AB	827.2 ± 343.5 AB	54
Zeal 72W, 2 oz product (early)	39.0 ± 14.3	13.5 ± 3.1 AB	67.7 ± 29.4 AB	43.0 ± 19.0 AB	855.2 ± 282.4 AB	53
dimethoate 4E, 0.50	24.8 ± 11.5	18.2 ± 7.5 AB	52.5 ± 12.8 AB	89.3 ± 26.3 AB	894.3 ± 208.2 AB	50
Furadan 4F 1.00	34.0 ± 12.2	9.8 ± 4.2 B	72.0 ± 30.9 AB	61.0 ± 33.7 AB	905.3 ± 381.7 AB	50
Zeal 0.69 EC, 16 oz product (early)	38.7 ± 14.5	34.2 ± 11.6 AB	49.2 ± 24.0 AB	64.7 ± 26.5 AB	945.0 ± 299.3 AB	48
Agri-Mek 0.15, 0.0094 (8 oz/a)	50.0 ± 23.6	39.3 ± 29.7 AB	57.8 ± 37.9 AB	62.7 ± 49.3 AB	1074.5 ± 722.2 AB	40
Capture 2E, 0.08	48.8 ± 14.8	16.3 ± 6.4 AB	101.0 ± 44.5 AB	47.8 ± 21.5 AB	1159.7 ± 401.6 AB	36
Comite II 6E, 1.69 (early)	26.5 ± 10.4	34.7 ± 12.7 AB	83.5 ± 40.2 AB	106.0 ± 44.6 AB	1290.9 ± 485.1 AB	28
UNTREATED CONTROL (A)	30.2 ± 14.1	34.0 ± 14.0 AB	96.8 ± 38.8 AB	86.2 ± 55.1 AB	1323.0 ± 477.1 AB	–
UNTREATED CONTROL (B)	49.0 ± 14.0	58.0 ± 17.8 A	173.0 ± 57.2 A	142.3 ± 53.5 A	2286.7 ± 627.5 A	–
F Value	1.35	2.89	2.83	2.19	2.89	–
p>F	0.1412	<0.0001	<0.0001	0.0025	<0.0001	–

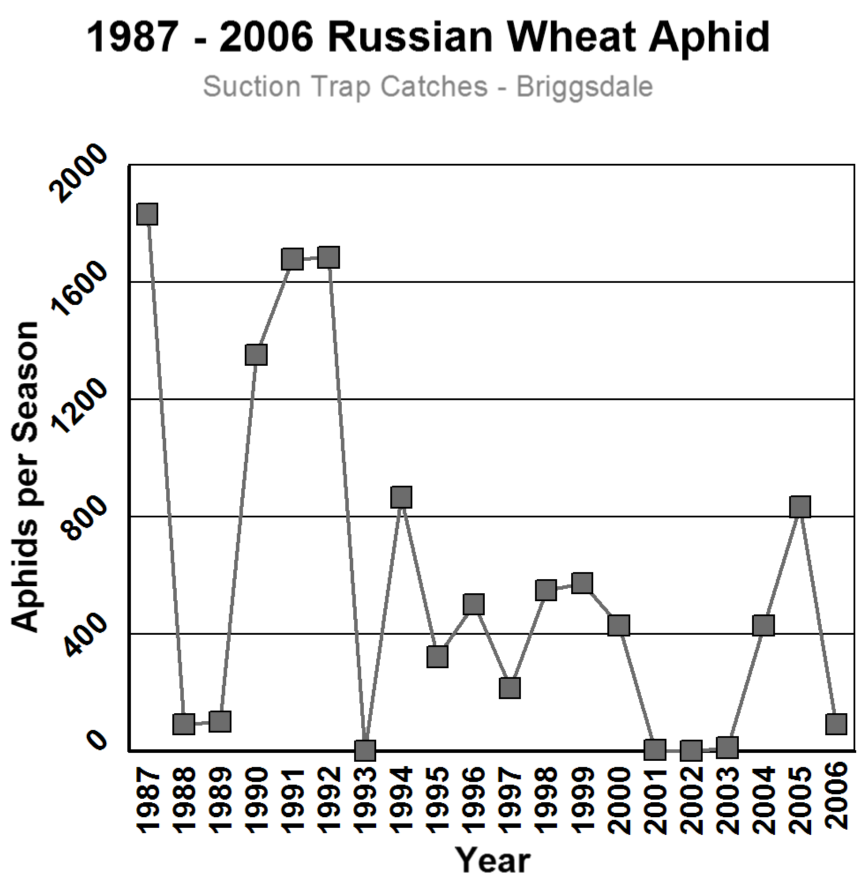
[1]SEM, standard error of the mean. Means in the same column followed by the same letters(s) are not statistically different, Tukey's HSD (∝=0.05).
[2]% reduction in total spider mite days per tiller, calculated by the Ruppel method.

Table 11. 2006 pheromone trap catches at ARDEC and Briggsdale.

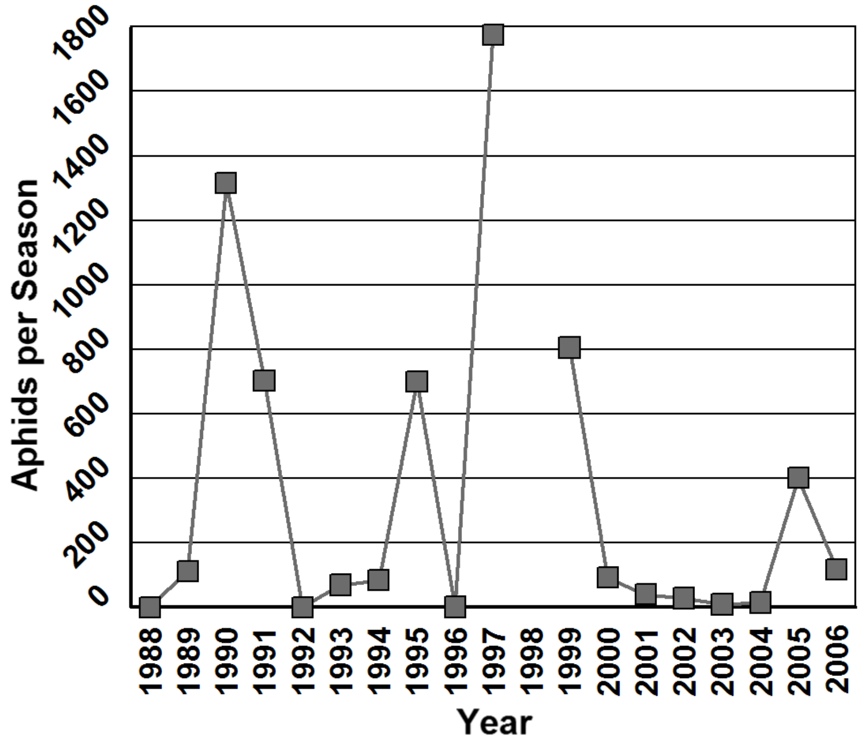
	Location							
	ARDEC – 1070		ARDEC – Kerble		Akron		Briggsdale[3]	
Species	Total Caught[2]	Trapping Period	Total Caught[2]	Trapping Period[2]	Total Caught[2]	Trapping Period[2]	Total Caught[2]	Trapping Period[2]
Army cutworm	14 (84)	8/24 - 10/12	21 (–)	8/24 - 10/12	41 (–)	8/21 - 10/9	130 (127)	8/24 - 10/12
Banded sunflower moth	189 (0)	6/29 - 9/14	214 (22)	6/29 - 9/14	–	–	–	–
Corn earworm	1 (1)	7/6 - 8/31	0 (–)	7/6 - 8/31	–	–	–	–
European corn borer (IA)[1]	6 (133)	5/26 - 9/21	7 (70)	5/26 - 9/21	–	–	–	–
Fall armyworm	46 (200)	7/6 - 9/21	72 (238)	7/6 - 9/21	–	–	–	–
Pale western cutworm	196 (150)	8/24 - 10/12	351 (–)	8/24 - 10/12	1 (–)	8/21 - 10/9	512 (275)	8/24 - 10/12
Southwestern corn borer	0 (–)	5/26 - 8/17	0 (0)	5/26 - 8/17	–	–	–	–
Sunflower moth	0 (0)	6/29 - 9/14	1 (2)	6/29 - 9/14	–	–	–	–
Western bean cutworm	5 (5)	6/29 - 8/17	50 (5)	6/29 - 8/17	–	–	–	–

[1] IA, Iowa strain
[2]–, not trapped. Number in () is 2005 total catch for comparison
[3]Briggsdale counts are the average of two traps

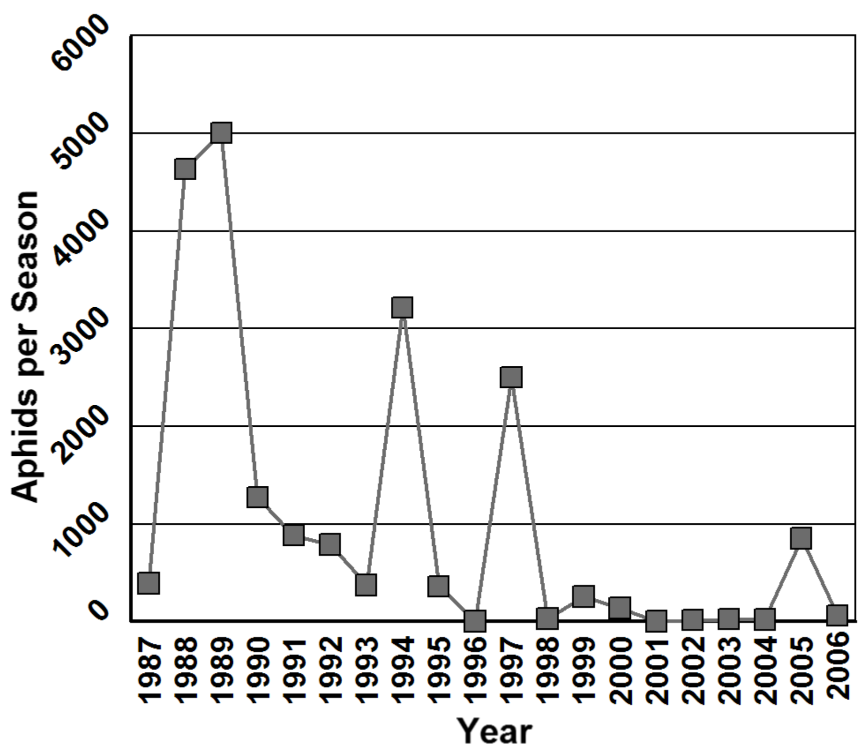

1988 - 2006 Russian Wheat Aphid
Suction Trap Catches - Akron
Aphids per Season
0
200
400
600
800
1000
1200
1400
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year


1987 - 2006 Russian Wheat Aphid
Suction Trap Catches - Briggsdale
Aphids per Season
0
400
800
1200
1600
2000
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year

1988 - 2006 Russian Wheat Aphid
Suction Trap Catches - Lamar



1987 - 2006 Russian Wheat Aphid
Suction Trap Catches - Walsh



INSECTICIDE PERFORMANCE SUMMARIES

Insecticide performance in a single experiment can be quite misleading. To aid in the interpretation of the tests included in this report, long term performance summaries for insecticides registered for use in Colorado are presented below. These summaries are complete through 2006.

Table 12. Performance of planting-time insecticides against western corn rootworm, 1987-2006, in northern Colorado

INSECTICIDE	IOWA 1-6 ROOT RATING[1]
AZTEC 2.1G	2.6 (29)
COUNTER 15G	2.6 (30)
CRUISER, 1.25 mg (AI)/seed	2.4 (5)
FORCE 1.5G (8 OZ) or 3G (4 OZ)	2.7 (28)
FORCE 3G (5 OZ)	2.5 (7)
FORTRESS 5G	2.8 (14)
LORSBAN 15G	3.0 (25)
PONCHO, 1.25 mg (AI)/seed	2.3 (7)
REGENT 4SC, 3-5 GPA	3.0 (5)
THIMET 20G	3.4 (15)
UNTREATED CONTROL	4.1 (36)

[1]Rated on a scale of 1-6, where 1 is least damaged, and 6 is most heavily damaged. Number in parenthesis is number of times tested for average. Planting time treatments averaged over application methods.

Table 13. Performance of cultivation insecticide treatments against western corn rootworm, 1987-2005, in northern Colorado.

INSECTICIDE	IOWA 1-6 ROOT RATING[1]
COUNTER 15G	2.8 (21)
FORCE 3G	3.3 (8)
FURADAN 4F, 2.4 OZ, BANDED OVER WHORL	3.2 (12)
FURADAN 4F, 1.0, INCORPORATED	3.3 (3)
LORSBAN 15G	3.1 (17)
THIMET 20G	2.9 (19)
UNTREATED CONTROL	4.2 (24)

[1]Rated on a scale of 1-6, where 1 is least damaged, and 6 is most heavily damaged. Number in () is number of times tested for average. Planting time treatments averaged over application methods.

Table 14. Insecticide performance against first generation European corn borer, 1982-2002, in northeast Colorado.

MATERIAL	LB/ACRE	METHOD[1]	% CONTROL[2]
DIPEL ES	1 QT + OIL	I	91 (4)
LORSBAN 15G	1.00 (AI)	A	77 (5)
LORSBAN 15G	1.00 (AI)	C	80 (6)
LORSBAN 4E	1.0 (AI)	I	87 (9)
POUNCE 3.2E	0.15 (AI)	I	88 (11)
POUNCE 1.5G	0.15 (AI)	C	87 (4)
POUNCE 1.5G	0.15 (AI)	A	73 (7)
THIMET 20G	1.00 (AI)	C	77 (4)
THIMET 20G	1.00 (AI)	A	73 (3)
WARRIOR 1E	0.03 (AI	I	85 (4)

[1]A = Aerial, C = Cultivator, I = Center Pivot Injection. CSU does not recommend the use of aerially-applied liquids for control of first generation European corn borer.
[2]Numbers in () indicate that percent control is the average of that many trials.

Table 15. Insecticide performance against western bean cutworm, 1982-2002, in northeast Colorado.

MATERIAL	LB (AI)/ACRE	METHOD[1]	% CONTROL[2]
CAPTURE 2E	0.08	A	98 (5)
CAPTURE 2E	0.08	I	98 (5)
LORSBAN 4E	0.75	A	88 (4)
LORSBAN 4E	0.75	I	94 (4)
POUNCE 3.2E	0.05	A	97 (7)
POUNCE 3.2E	0.05	I	99 (5)
WARRIOR 1E (T)	0.02	I	96 (2)

[1]A = Aerial, I = Center Pivot Injection
[2]Numbers in () indicated that percent control is average of that many trials.

Table 16. Insecticide performance against second generation European corn borer, 1982-2002, in northeast Colorado.

MATERIAL	LB (AI)/ACRE	METHOD[1]	% CONTROL[2]
DIPEL ES	1 QT PRODUCT	I	56 (16)
CAPTURE 2E	0.08	A	85 (8)
CAPTURE 2E	0.08	I	86 (14)
FURADAN 4F	1.00	A	62 (6)
LORSBAN 4E	1.00	A	41 (6)
LORSBAN 4E	1.00 + OIL	I	72 (14)
PENNCAP M	1.00	A	74 (7)
PENNCAP M	1.00	I	74 (8)
POUNCE 3.2E	0.15	I	74 (11)
WARRIOR 1E	0.03	A	81 (4)
WARRIOR 1E	0.03	I	78 (4)

[1]A = Aerial, I = Center Pivot Injection
[2]Numbers in () indicate how many trials are averaged.

Table 17. Performance of hand-applied insecticides against alfalfa weevil larvae, 1984-2006, in northern Colorado.

PRODUCT	LB (AI)/ACRE	% CONTROL AT 2 WK[1]
BAYTHROID 2E (or XL equivalent rate)	0.025	97 (13)
BAYTHROID 2E (or XL equivalent rate)	0.025 (early)[3]	96 (4)
FURADAN 4F	0.25	87 (15)
FURADAN 4F	0.50	91 (28)
FURADAN 4F+DIMETHOATE 4E	0.50 + 0.25	90 (9)
LORSBAN 4E	0.75	93 (20)
LORSBAN 4E	1.00	96 (6)
LORSBAN 4E	0.50	83 (10)
MUSTANG MAX	0.025	90 (4)
MUSTANG MAX	0.025 (early)[3]	94 (4)
PENNCAP M	0.75	84 (11)
PERMETHRIN [2]	0.10	67 (7)
PERMETHRIN [2]	0.20	80 (4)
STEWARD	0.065	74 (5)
STEWARD	0.110	83 (4)
WARRIOR 1E or T	0.02	92 (17)
WARRIOR 1E or T	0.02 (early)[3]	68 (5)
WARRIOR 1E or T	0.03	93 (6)

[1]Number in () indicates number of years included in average.
[2]Includes both Ambush 2E and Pounce 3.2E.
[3]Early treatment timed for control of army cutworm

Table 18. Control of Russian wheat aphid with hand-applied insecticides in winter wheat, 1986-2006[1].

PRODUCT	LB (AI)/ACRE	TESTS WITH > 90% CONTROL 21 DAT	TOTAL TESTS	% TESTS
LORSBAN 4E	0.50	26	42	62
DIMETHOATE 4E	0.375	8	36	22
MUSTANG MAX	0.025	2	4	50
PENNCAP M	0.75	3	18	17
LORSBAN 4E	0.25	10	24	42
LORSBAN 4E	0.38	4	5	80
WARRIOR 1E	0.03	3	14	21

[1]Includes data from several states.

Table 19. Control of spider mites in artificially-infested corn with hand-applied insecticides, ARDEC, 1993-2006.

PRODUCT	LB (AI)/ACRE	% REDUCTION IN TOTAL MITE DAYS[1]
CAPTURE 2E	0.08	53 (13)
CAPTURE 2E + DIMETHOATE 4E	0.08 + 0.50	65 (13)
CAPTURE 2E + FURADAN 4F	0.08 + 0.50	66 (4)
COMITE II	1.64	20 (12)
COMITE II	2.53	57 (5)
COMITE II + DIMETHOATE 4E	1.64 + 0.50	54 (8)
DIMETHOATE 4E	0.50	44 (13)
FURADAN 4F	1.00	41 (13)
FURADAN 4F + DIMETHOATE 4E	1.00 + 0.50	46 (8)
OBERON	0.09	57 (3)

[1]Number in () indicates number of tests represented in average.

Table 20. Control of sunflower stem weevil with planting and cultivation treatments, USDA Central Great Plains Research Station, 1998-2002.

PRODUCT	LB (AI)/ACRE	TIMING	% CONTROL[1]
BAYTHROID 2E	0.02	CULTIVATION	57 (3)
BAYTHROID 2E	0.03	CULTIVATION	52 (3)
FURADAN 4F	0.75	CULTIVATION	61 (3)
FURADAN 4F	1.0	PLANTING	91 (3)
FURADAN 4F	1.0	CULTIVATION	83 (3)
WARRIOR 1E	0.02	CULTIVATION	63 (3)
WARRIOR 1E	0.03	CULTIVATION	61 (3)

[1]Number in () indicates number of tests represented in average.

ACKNOWLEDGMENTS

2006 COOPERATORS

PROJECT	LOCATION	COOPERATORS
Alfalfa insecticides	ARDEC, Fort Collins	Reg Koll, Chris Fryrear, Mark Collins
Barley insecticides	ARDEC, Fort Collins	Reg Koll, Chris Fryrear, Mark Collins
Corn rootworm control	ARDEC, Fort Collins	Reg Koll, Chris Fryrear, Mark Collins
Western bean cutworm control	ARDEC, Fort Collins	Reg Koll, Chris Fryrear, Mark Collins
Corn spider mite control	ARDEC, Fort Collins	Reg Koll, Chris Fryrear, Mark Collins, Bob Hammon
Russian wheat aphid control	ARDEC, Fort Collins	Reg Koll, Chris Fryrear, Mark Collins
Pheromone traps	ARDEC, Fort Collins	Linda Stevens, Reg Koll, Chris Fryrear, Mark Collins
Pheromone traps	Briggsdale	Justin Herman, Stan Cass
Suction trap	Briggsdale	Justin Herman, Stan Cass
Suction trap	Akron (Central Great Plains Research Station)	Mike Koch, Merle Vigil
Suction trap	Lamar	John Stulp, Thia Walker
Suction trap	Walsh (Plainsman Research Center)	Deb Harn, Kevin Larson

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