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CONTROL OF RUSSIAN WHEAT APHID IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1998

Jeff Rudolph, Terri Randolph, Aaron Spriggs, Hayley Miller, Shawn Walter, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF RUSSIAN WHEAT APHID IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1998: Treatments were applied on 5 May 1998 with a 'rickshaw-type' CO_2 powered sprayer calibrated to apply 20 gal/acre at 3 mph and 30 psi through four 8004 (LF4) nozzles mounted on a 5.0 ft boom. Conditions were cloudy with winds from the north at approximately 5 mph and temperature was 60EF at the time of treatment. Plots were 6.6 ft by 28.0 ft and were arranged in six replicates of a randomized, complete block design. Crop stage at application was stem elongation (Zadoks 32-33). The crop had been infested with greenhouse-reared aphids on 20 and 24 March 1998.

Treatments were evaluated by collecting 10 symptomatic tillers along the middle rows of each plot on the day prior and one, two and three weeks after treatment. Tiller samples were placed in Berlese funnels for 24 hours to extract aphids into alcohol for counting. Precounts averaged 107 ± 6 Russian wheat aphids per 10 symptomatic tillers. Aphid counts transformed by the square root + ½ method were used for analysis of variance and mean separation by the Student-Neuman-Keul test (a=0.05). 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). Reductions in insect days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100). Insect days were also compared by analysis of variance and the Student-Neuman-Keul test (a=0.05) with original means presented in the tables.

Aphid pressure was as severe as observed in past artificially-infested winter wheat experiments. All treatments had fewer aphid days than the untreated control over the course of the experiment. All treatments with the exception of CGA293343 25 WP, 0.022 had fewer aphids than the untreated control at 3 weeks after treatment. Warrior 1E and Lorsban 4E-SG 0.38 and 0.50 lb(AI)/acre had reduced aphid days compared to CGA293343 25 WP, 0.022. There were no differences among other treatments in terms of reduced aphid days. No treatments reduced total aphid days by more than 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* (Mordvilko)
Cultivar:	'TAM 107'
Planting Date:	12 September 1997
Irrigation:	Prior to planting
Crop History:	Pinto beans in 1997
Herbicide:	None
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Clay, OM 1.9%, pH 8.0
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (west side of Block 400B)

Table 1. Control of Russian wheat aphid in winter wheat, ARDEC, Fort Collins, CO, 1998.

PRODUCT, LB (AI)/ACRE	APHIDS PER 10 TILLERS ± SEM[1]			TOTAL APHID DAYS	% REDUCTION[2]
	1 WEEK	2 WEEKS	3 WEEKS		
WARRIOR 1E, 0.03	9 ± 5 B	34 ± 31 B	52 ± 28 E	934 ± 290 C	82
LORSBAN 4E-SG, 0.38	12 ± 3 B	7 ± 2 B	92 ± 48 DE	864 ± 186 C	84
LORSBAN 4E-SG, 0.50	4 ± 2 B	17 ± 12 B	100 ± 35 CDE	945 ± 215 C	82
LORSBAN 4E-SG, 0.25	11 ± 4 B	32 ± 11 B	113 ± 45 CDE	1085 ± 162 BC	80
TD 2351-01 4F, 0.75	41 ± 24 B	41 ± 24 B	140 ± 52 CDE	1385 ± 328 BC	74
CAPTURE 2E, 0.03	19 ± 14 B	72 ± 28 AB	180 ± 57 BCDE	1659 ± 365 BC	69
DI-SYSTON 8E, 0.75	35 ± 23 B	72 ± 52 AB	227 ± 142 BCDE	1926 ± 985 BC	64
DIMETHOATE 4E, 0.38	15 ± 7 B	33 ± 11 B	225 ± 76 BCDE	1658 ± 342 BC	69
CGA293343 25 WP, 0.044	25 ± 7 B	63 ± 6 AB	368 ± 65 BCD	2235 ± 298 BC	58
PENNCAP M 2FM, 0.75	29 ± 13 B	39 ± 14 B	456 ± 155 BC	2372 ± 399 BC	55
CGA293343 25 WP, 0.022	54 ± 13 AB	95 ± 27 AB	583 ± 186 AB	3371 ± 633 B	37
UNTREATED	100 ± 22 A	172 ± 41 A	874 ± 163 A	5310 ± 795 A	—
F Value	2.91	2.41	5.34	6.10	
p > F	0.0017	0.0082	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, SNK (a=0.05).
[2]Percent reduction in total aphid days, calculated by the Ruppel method.

CONTROL OF RUSSIAN WHEAT APHID IN SPRING WHEAT, LEWTON FARM, AKRON, CO, 1998

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CONTROL OF RUSSIAN WHEAT APHID IN SPRING WHEAT, LEWTON FARM, AKRON, CO 1998: Treatments were applied on 18 May 1998 with a CO_2-powered A002-TX Spray System sprayer calibrated to apply 10 gal/acre through six TX 6 nozzles mounted on a 4 ft boom. South winds were approximately 3 mph and temperature was 60EF. Plots were 4 ft by 25 ft and were arranged in four replicates of a randomized complete block design. Crop stage at application was stem elongation (Zadoks 33). Each plot had been infested with 270 greenhouse-reared Russian wheat aphids per one yard of drill row on 18 May 1998.

Treatments were evaluated by collecting all the tillers in one foot of the infested drill row at 7, 14 and 20 days after application. Tiller samples were placed in Berlese funnels for 24 hours to extract aphids into alcohol for counting. Aphid counts transformed by the square root + ½ method were used for analysis of variance and mean separation by the Student-Neuman-Keul test (a=0.05). 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). Reductions in insect days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100). Insect days were also compared by analysis of variance and the Student-Neuman-Keul test (a=0.05) with original means presented in the tables.

Aphid pressure was severe. Both treatments had fewer Russian wheat aphids than the untreated control for the duration of the experiment. The Warrior treatment gave control equivalent to the commercial standard, Lorsban, at 1, 2 and 3 weeks after treatment. There were no differences among treatments in terms of reduced aphid days. No phytotoxicity was observed with any treatment.

Field History

Pest:	Russian wheat aphid, *Diuraphis noxia* (Mordvilko)
Cultivar:	Spring Wheat 'Sharp'
Planting Date:	24 March 1998
Irrigation:	None
Crop History:	Winter Wheat
Herbicide:	Ally, 0.10 oz/acre
Insecticide:	None prior to experiment
Fertilization:	40 N, 20 P
Soil Type:	Platner Orego Loam, OM 1.5%, pH 7.0
Location:	SW ¼ Section 15, 1N 51W, Washington County, CO

Table 1. Control of Russian wheat aphid in spring wheat, Lewton Farm, Akron, CO, 1998.

	APHIDS PER FOOT OF ROW ± SEM[1]				
PRODUCT, LB (AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**	**TOTAL APHID DAYS**	**% REDUCTION[2]**
WARRIOR IE, T, 0.03	16 ± 8 B	49 ± 19 B	52 ± 22 B	580 ± 155	96
LORSBAN 4E, 0.50	1 ± 1 B	22 ± 9 B	22 ± 8 B	233 ± 77	98
UNTREATED CONTROL	177 ± 79 A	823 ± 293 A	1891 ± 850 A	12996 ± 5255	—
F Value	8.20	4.39	4.86	5.62	—
p > F	0.0117	0.0499	0.0401	0.0421	—

[1]SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not statistically different, SNK (a=0.05).
[2]Percent reduction in total aphid days, calculated by the Ruppel method.

CONTROL OF RUSSIAN WHEAT APHID IN SPRING BARLEY WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1998

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CONTROL OF RUSSIAN WHEAT APHID IN SPRING BARLEY WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1998: Treatments were applied on 1, 18 and 29 May 1998 with a 'rickshaw-type' CO_2 powered sprayer calibrated to apply 20 gal/acre at 3 mph and 30 psi through four 8004 (LF4) nozzles mounted on a 5.0 ft boom. Conditions were calm and temperature was 60EF at the time of the treatment application. Plots were 6.6 ft by 25.0 ft and were arranged in six replicates of a randomized, complete block design. Crop stage at the application dates were 3-4 leaf (Zadoks 13-14), tillering (Zadoks 24-25) and stem elongation (Zadoks 33-34). The crop had been infested at the 2 leaf stage (Zadoks 12) with greenhouse-reared aphids on 20 April 1998.

Treatments were evaluated by collecting 20 symptomatic tillers per plot one, two and three weeks after the early treatments were applied on 18 May. Tiller samples were placed in Berlese funnels for 24 hours to extract aphids into alcohol for counting. Aphid counts transformed by the square root + ½ method were used for analysis of variance and mean separation by the Student-Neuman-Keul test (a=0.05). 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). Reductions in insect days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100). Insect days were also compared by analysis of variance and the Student-Neuman-Keul test (a=0.05) with original means presented in the tables.

Aphid pressure was not as severe as observed in past artificially-infested winter wheat experiments. All treatments had fewer total aphid days than the untreated control over the course of the experiment. All treatments had fewer aphids than the untreated control at 3 weeks after treatment. There were no differences among treatments in terms of reduced aphid days. Warrior 1E (0.02 early and 0.02 15 days later), Warrior 1E (0.03 early and 0.03 30 days later) and Lorsban 4E, 0.50 lb(AI)/acre reduced total aphid days by more than 90%, the level of performance observed by the more effective treatments in past winter wheat experiments. No phytotoxicity was observed with any treatment. Treatment yields were similar to the untreated control.

Field History

Pest:	Russian wheat aphid, *Diuraphis noxia* (Mordvilko)
Cultivar:	Moravian 14
Planting Date:	19 March 1998
Irrigation:	Furrow
Crop History:	Pinto beans in 1997
Herbicide:	Bronate (1.2 pts/acre) and Harmony Extra (0.3 oz/acre) at late tillering (Zadocks 29-31)
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Clay, OM 1.9%, pH 8.0
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (east side of Block 300B)

Table 1. Control of Russian wheat aphid in spring barley, ARDEC, Fort Collins, CO, 1998.

	APHIDS PER 20 TILLERS ± SEM[1]				
PRODUCT, LB(AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**	**TOTAL APHID DAYS ± SEM[1]**	**% REDUCTION[2]**
WARRIOR 1E, 0.03 EARLY AND 0.03 30 DAYS LATER	9 ± 5 B	12 ± 5 B	6 ± 4 B	137 ± 55 B	96
WARRIOR 1E, 0.02 EARLY AND 0.02 15 DAYS LATER	6 ± 3 B	21 ± 10 B	7 ± 3 B	197 ± 73 B	94
WARRIOR 1E, 0.03 EARLY	8 ± 6 B	45 ± 25 B	48 ± 38 B	508 ± 325 B	83
LORSBAN 4E-SG, 0.50 15 DAYS AFTER EARLY	46 ± 13 A	10 ± 4 B	26 ± 9 B	319 ± 102 B	91
WARRIOR 1E, 0.03 15 DAYS AFTER EARLY	70 ± 9 A	71 ± 58 B	138 ± 114 B	1221 ± 826 B	64
UNTREATED	53 ± 9 A	195 ± 49 A	518 ± 110 A	3362 ± 695 A	—
F Value	15.38	2.78	4.28	6.44	
p > F	< 0.0001	0.0193	0.0015	0.0006	

[1]SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not significantly different, SNK (a=0.05).
[2]Percent reduction in total aphid days, calculated by the Ruppel method.

Table 2. Control of Russian wheat aphid in spring barley, ARDEC, Fort Collins, CO, 1998.

PRODUCT, LB(AI)/ACRE	% INFESTED TILLERS			YIELD[1]
	1 WEEK	2 WEEKS	3 WEEKS	
WARRIOR 1E, 0.02 EARLY AND 0.02 15 DAYS LATER	3	10	2	89
WARRIOR 1E, 0.03 EARLY	6	16	19	90
WARRIOR 1E, 0.03 EARLY AND 0.03 30 DAYS LATER	3	3	3	90
LORSBAN 4E-SG, 0.50 15 DAYS AFTER EARLY	32	24	20	73
WARRIOR 1E, 0.03 15 DAYS AFTER EARLY	42	18	27	91
UNTREATED	42	63	80	78
F Value				1.22
p > F				0.3297

[1]Yield presented in bushels/acre adjusted to 12% moisture.

CONTROL OF ALFALFA INSECTS WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1998

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CONTROL OF ALFALFA INSECTS, ARDEC, FORT COLLINS, CO, 1998: Treatments were applied on 20 May 1998 with a 'rickshaw-type' CO_2 powered sprayer calibrated to apply 20 gal/acre at 3 mph and 30 psi through six 8004 (LF4) nozzles mounted on a 10.0 ft boom. Conditions were calm and overcast and temperature was 60EF at the time of treatment. Plots were 10.0 ft by 30.0 ft and arranged in four replicates of a randomized, complete block design. Untreated control and Furadan 4F plots were replicated eight times for a more accurate comparison of treatment effects on yield. Crop height at the time of treatment was 1.5 ft.

Treatments were evaluated by taking 10, 180 degree sweeps per plot with a standard 15 inch diameter insect net one, two and three weeks after treatment. Precounts were taken one day prior to treatment by taking 10, 180 degree sweeps in five locations across the experiment. Alfalfa weevil larvae, alfalfa weevil adults and pea aphids were counted. Precounts averaged 163.2 ± 19.1 alfalfa weevil larvae, 3.8 ± 0.8 alfalfa weevil adults and 12.4 ± 2.2 pea aphids per 10 sweeps. Insect counts transformed by the square root + ½ method were used for analysis of variance and means separation by the Student-Neuman-Keul test (a=0.05). Original means are presented in the tables.

Alfalfa weevil pressure was moderately high. All treatments had fewer alfalfa weevil larvae than the untreated control at one, two and three weeks after treatment. No treatment had fewer alfalfa weevil adults than the untreated control at any sample date. The Warrior treatment had fewer pea aphids than the untreated control at one, two and three weeks after treatment. No phytotoxicity was observed with any treatment. Although the plots treated with Furadan 4F, 0.50 lb(AI)/acre yielded 10.9% more than the untreated plots, this difference was not significant (two-tailed t-test, t=1.4499, df=14, $p(t>t_{0.05})$ = 0.1691). Yield reduction measured since 1995 has averaged 5.5%, with a range of 2.3% to 7.4%.

Field History

Pests:	Alfalfa weevil, *Hypera postica* (Gyllenhal)
	Pea aphid, *Acyrthosiphon pisum* (Harris)
Cultivar:	Unknown
Plant Stand:	Uniform, few weeds
Irrigation:	Linear move sprinkler with drop nozzles
Crop History:	Alfalfa since 1994
Herbicide:	None
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Clay, OM 1.7%, pH 7.8
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO, 80524 (Block 1030)

Table 1. Control of alfalfa weevil larvae, ARDEC, Fort Collins, CO, 1998.

	ALFALFA WEEVIL LARVAE PER 10 SWEEPS ± SEM[1]		
PRODUCT, LB (AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**
BAYTHROID 2E, 0.025	12.0 ± 3.9 BC	1.3 ± 0.3 C	0.5 ± 0.5 D
WARRIOR 1E, 0.02	19.3 ± 5.2 BC	0.8 ± 0.5 C	1.5 ± 0.5 D
TD 2344-02 0.8E, 0.025	6.8 ± 1.9 C	4.3 ± 2.0 C	2.5 ± 0.9 D
PENNCAP M 2FM, 0.75	7.8 ± 3.0 C	5.5 ± 1.2 C	6.3 ± 0.6 CD
TD 2344-02 0.8E, 0.04	13.8 ± 6.3 BC	2.5 ± 1.3 C	4.3 ± 2.5 D
FURADAN 4F + DIMETHOATE 4E, 0.50 + 0.25	13.7 ± 4.3 BC	2.0 ± 1.2 C	19.8 ± 5.6 CD
FURADAN 4F, 0.50[2]	9.8 ± 2.1 B	6.4 ± 1.1 C	19.8 ± 3.1 CD
FURADAN 4F + POUNCE 3.2E, 0.50 + 0.05	12.8 ± 5.1 BC	7.0 ± 1.7 C	21.3 ± 10.3 CD
LORSBAN 4E, 0.75	12.0 ± 2.3 BC	13.8 ± 3.4 C	34.3 ± 6.7 C
LORSBAN 4E, 0.50	14.3 ± 3.8 BC	15.3 ± 3.3 C	40.3 ± 8.4 C
FURADAN 4F, 0.25	16.5 ± 6.2 BC	41.3 ± 14.2 BC	140.3 ± 59.8 B
POUNCE 3.2E, 0.10	62.8 ± 24.0 B	82.5 ± 30.9 B	106.3 ± 19.7 B
UNTREATED[2]	319.9 ± 55.4 A	636.5 ± 95.6 A	484.0 ± 68.7 A
F Value	30.34	53.63	60.55
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, SNK (a=0.05)
[2]Treatment repeated (8 replicates rather than 4) for purposes of measuring yield.

Table 2. Control of alfalfa weevil adults, ARDEC, Fort Collins, CO, 1998.

	ALFALFA WEEVIL ADULTS PER 10 SWEEPS ± SEM[1]		
PRODUCT, LB(AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**
BAYTHROID 2E, 0.025	1.0 ± 0.7	0.5 ± 0.3	2.5 ± 1.2
WARRIOR 1E, 0.02	1.8 ± 1.1	1.3 ± 0.5	3.5 ± 0.9
TD 2344-02 0.8E, 0.025	3.0 ± 0.5	0.3 ± 0.3	4.5 ± 1.6
PENNCAP M 2FM, 0.75	0.0 ± 0.0	0.3 ± 0.3	1.5 ± 0.3
TD 2344-02 0.8E, 0.04	2.0 ± 0.9	0.8 ± 0.3	3.3 ± 0.5
FURADAN 4F + DIMETHOATE 4E, 0.50 + 0.25	0.7 ± 0.7	0.3 ± 0.3	1.3 ± 0.8
FURADAN 4F, 0.50[2]	0.6 ± 0.4	0.6 ± 0.5	3.1 ± 1.2
FURADAN 4F + POUNCE 3.2E, 0.50 + 0.05	0.8 ± 0.8	0.5 ± 0.3	5.0 ± 0.4
LORSBAN 4E, 0.75	0.3 ± 0.3	1.8 ± 0.5	2.8 ± 0.3
LORSBAN 4E, 0.50	0.5 ± 0.3	0.8 ± 0.5	3.5 ± 0.9
FURADAN 4F, 0.25	1.0 ± 0.4	1.3 ± 0.3	4.5 ± 1.2
POUNCE 3.2E, 0.10	1.5 ± 0.5	1.0 ± 0.4	2.3 ± 0.3
UNTREATED[2]	1.9 ± 0.7	0.4 ± 0.2	3.2 ± 1.0
F Value	1.95	1.40	1.38
p > F	0.0546	0.2022	0.2127

[1]SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not statistically different, SNK (a=0.05)
[2]Treatment repeated (8 replicates rather than 4) for purposes of measuring yield.

Table 3. Control of pea aphids, ARDEC, Fort Collins, CO, 1998.

PRODUCT, LB(AI)/ACRE	PEA APHIDS PER 10 SWEEPS ± SEM[1]		
	1 WEEK	2 WEEKS	3 WEEKS
WARRIOR 1E, 0.02	2.8 ± 2.4 C	4.8 ± 1.2 C	13.5 ± 3.2 C
POUNCE 3.2E, 0.10	0.0 ± 0.0 C	42.8 ± 16.5 AB	38.0 ± 6.5 BC
TD 2344-02 0.8E, 0.04	4.8 ± 2.3 C	37.0 ± 10.9 AB	43.0 ± 8.2 BC
BAYTHROID 2E, 0.025	1.3 ± 0.5 C	37.0 ± 7.2 AB	49.8 ± 13.9 BC
FURADAN 4F + DIMETHOATE 4E, 0.50 + 0.25	2.0 ± 1.5 C	24.3 ± 1.5 B	61.0 ± 18.6 B
PENNCAP M 2FM, 0.75	11.0 ± 5.3 C	25.8 ± 7.5 B	94.5 ± 25.1 AB
TD 2344-02 0.8E, 0.025	4.5 ± 2.9 C	44.3 ± 13.3 AB	72.3 ± 16.4 B
LORSBAN 4E, 0.75	0.3 ± 0.3 C	26.8 ± 8.3 B	82.3 ± 3.9 B
FURADAN 4F + POUNCE 3.2E, 0.50 + 0.05	0.8 ± 0.5 C	18.3 ± 3.5 B	84.5 ± 44.6 B
LORSBAN 4E, 0.50	0.5 ± 0.5 C	27.0 ± 2.2 B	85.0 ± 31.8 B
FURADAN 4F, 0.50[2]	5.6 ± 1.7 C	44.3 ± 5.9 AB	102.5 ± 17.1 AB
UNTREATED[2]	56.3 ± 13.3 A	49.6 ± 8.0 AB	107.9 ± 33.6 AB
FURADAN 4F, 0.25	29.8 ± 14.2 B	68.5 ± 12.1 A	173.8 ± 13.4 A
F Value	19.48	6.27	5.42
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, SNK (a=0.05)
[2]Treatment repeated (8 replicates rather than 4) for purposes of measuring yield.

CONTROL OF ARMY CUTWORM IN WINTER WHEAT, OESTMAN FARM, WRAY CO, 1998

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CONTROL OF ARMY CUTWORM IN WINTER WHEAT, OESTMAN FARM, WRAY, CO 1998: Treatments were applied 9 April 1998. Each treatment consisted of four replicates of 10 ft by 50 ft plots arranged in a randomized complete block design. Treatments were applied with a CO_2 powered sprayer calibrated to apply 11.5 gal/acre through 6 nozzles mounted 18 inches apart on an 8 ft boom held by hand at 21 inch above the crop canopy. Conditions at the time of treatment were 55EF with a less than 1 mph west wind and a relative humidity of 35%.

Treatments were evaluated one day prior (precount) and 7 and 14 d after treatment by randomly sampling an area 1 ft wide by 3 ft long by 4 inches deep in each plot, including the row of wheat on each side. Live army cutworms found within the sample area were counted. Precounts averaged 4.6 ± 1.5 army cutworms per three ft^2. Army cutworm counts were subjected to analysis of variance and treatment means were then separated by the Student-Neuman-Keul Method (a=0.05).

The weather between 7 April and 17 April 1998 was unseasonably cool with a low of 22EF and a high of 55EF which reduced army cutworm activity and resulted in less control than expected at seven days. All treatments provided similar control of army cutworm (Table 1) with the exception of Lorsban 4E, 0.5 lb (AI)/acre, which was less effective than the other treatments.

Field History

Pest:	Army cutworm, *Euxoa auxiliaris* (Grote)
Cultivar:	'TAM 107'
Planting Date:	20 September 1997
Herbicide:	None
Insecticide:	None prior to experiment
Fertilization:	50 N
Soil Type:	Sandy loam
Location:	Oestman Farm, Wray, Yuma County, CO, NW ¼, Section 20, 15N, 43W

Table 1. Rescue treatments for control of army cutworm in winter wheat, Oestman Farm, Wray, CO, 1998.

	17 APRIL 1998		23 APRIL 1998	
PRODUCT, LB (AI)/ACRE	**LARVAE/FT^2 [1]**	**% CONTROL**	**LARVAE/FT^2 [1]**	**% CONTROL**
WARRIOR 1E, 0.03	0.0 B	100	0.0 C	100
BAYTHROID 2E, 0.04	0.3 B	93	0.0 C	100
WARRIOR 1E, 0.01	0.5 B	87	0.0 C	100
WARRIOR 1E, 0.02	0.3 B	93	0.3 C	95
BAYTHROID 2E, 0.03	1.8 B	53	0.3 C	95
BAYTHROID 2E, 0.02	0.5 B	87	0.5 C	90
LORSBAN 4E, 0.50	0.8 B	80	1.5 B	71
UNTREATED CONTROL	3.8 A	—	5.3 A	—
F Value	4.864		36.024	
p > F	0.0022		< 0.0001	

[1]Means in the same column followed by the same letter(s) are not statistically different, SNK (a=0.05).

CONTROL OF WIREWORM IN FIELD CORN WITH PLANTING TIME TREATMENTS, JESSE FARM, AKRON, CO, 1998

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CONTROL OF WIREWORM IN FIELD CORN WITH PLANTING TIME TREATMENTS, JESSE FARM, AKRON, CO, 1998: Treatments were applied on 27 May 1998. Each treatment consisted of three replicates of one 50 ft row plots arranged in a randomized complete block design. A CO_2-powered applicator mounted on the planter was used apply Regent 80 WG at rates of 0.13 lb(AI)/acre and 0.06 lb(AI)/acre. Spray volume was 1 gpa through microtubes directed into the seed furrow ½ inch above the seed. Counter 20CR, 1.31 lb(AI)/acre was applied in-furrow with a modified Wintersteiger meter. All four treatments were made with a two-row John Deere 7200 Maxi-Merge planter. Applications were made at 3.4 mph.

Three 4th to 5th instar wireworms were placed in the soil every six inches along five ft of drill row on 28 May 1998. A core of soil taken to seed placement depth was removed with a standard soil probe, three wireworms dropped in the hole, and the soil core replaced.

All wireworm treatments were evaluated on 26 June 1998 by counting surviving plants in the infested five ft of row. In addition, the remaining plants were removed and evaluated for damage using the following 0 - 3 scale:

- 0 - No feeding damage evident
- 1 - Feeding hole(s) observed in the decaying seed hull
- 2 - Feeding hole(s) observed in the decaying seed hull plus one feeding scar in the mesocotyl
- 3 - Feeding hole(s) observed in the decaying seed hull plus multiple holes and feeding scars in the mesocotyl and severe stunting of the plant

Plants with a rating of three were considered to be non-viable and were not included in the population figures (Table 1). Plot means were subjected to analysis of variance and treatment means were then separated by the Student-Neuman-Kuel Method (a=0.05).

All treatments controlled wireworms compared to the untreated control. There was no significant difference among treatments.

Field History

Pest:	Great Basin wireworm, *Ctenicera pruinina* (Horn)
Cultivar:	Pioneer '3514'
Planting Date:	27 May 1998
Plant Population:	32,000
Irrigation:	Sprinkler
Crop History:	Field corn since 1995
Herbicide:	Atrazine 1.0 lb (AI)/acre, Marksman 2.5 pt/acre
Insecticide:	None prior to experiment
Fertilization:	220 N, 35 P, 1 Zn
Soil Type:	Platner clay loam, OM 1.8%, pH 7.8
Location:	Washington County, SE ¼, Section 10, 2S-52

Table 1. Control of Great Basin wireworm in field corn with soil applied insecticides, Jesse Farm, Akron, CO, 1998.

TREATMENT, LB (AI)/ACRE	0 - 3 DAMAGE RATING[1]	PLANTS PER 5 FT ROW[1]
COUNTER 20CR, 1.31	0.0 B	10.0 B
REGENT 80WG, 0.13	0.6 B	8.3 AB
REGENT 80WG, 0.06	0.6 B	7.7 AB
UNTREATED CONTROL	1.8 A	4.3 A
F Value	9.638	5.710
p>F	0.0104	0.0342

[1]Means in the same column followed by the same letter(s) are not statistically different, SNK ("=0.05).

CONTROL OF WESTERN CORN ROOTWORM, EARL JESSE FARM, AKRON, CO, 1998

Stan Pilcher, Dave Kennedy, Marion Seward, Jodi Pilcher, Golden Plains Area Cooperative Extension; Mike Koch, Central Great Plains Research Station; Jeff Rudolph, Terri Randolph, Shawn Walter, Alison Clayshulte, Hayley Miller, Aaron Spriggs, Kelly McGinley, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF WESTERN CORN ROOTWORM, EARL JESSE FARM, AKRON, CO, 1998: Planting time treatments were applied on 3 May 1998 and cultivation treatments (both granular and liquid) were applied on 15 June 1998. All plots, except those treated with broadcast Furadan 4F, consisted of one 50-ft row and were arranged in six replicates of a randomized complete block design. The plots treated with broadcast Furadan 4F treatments consisted of two 50 ft rows. At the time of cultivation, plants were eight to 10 inches in height and in the six-leaf stage. Western corn rootworm development ranged form second stage egg to late first instar larvae. Granular insecticides were applied with modified Wintersteiger meters mounted on a two-row John Deere Maxi-Merge planter. In-furrow granular applications were accomplished by directing a drop tube into the seed furrow. T-band applications were applied with a 4-inch John Deere spreader located between the disk openers and the press wheel. A CO_2 powered applicator mounted on the planter was used apply liquid insecticides through microtubes directed into the seed furrow ½ inch above the seed. Cultivation applications were made with 6 inch Gandy spreaders, mounted on an Orthman cultivator and held 1 to 2 inches above the plant. Applications were made at 3.4 mph. Broadcast treatments were applied with a CO_2 powered, hand-held sprayer calibrated to deliver 23.0 gal/acre at 30 psi through four 80015 TJ VS nozzles. Rainfall and irrigation during this experiment are shown in Figure 1.

All western corn rootworm treatments were evaluated on 16 July 1998 by digging three plants per plot. Plants were removed at three-plant intervals starting at 20 ft into the plot. 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 subjected to analysis of variance and treatment means were then separated by the Student-Neuman-Kuel Method (a=0.05). Also, treatment efficiency was determined as the percentage of roots in a treatment (18 roots) with a rating of 3.0 or lower.

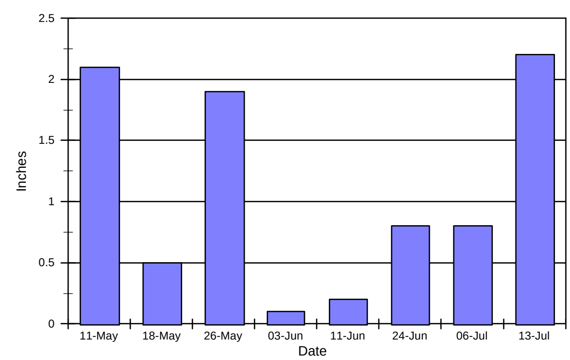

Figure 1
Rainfall and Irrigation, Jesse Farm, Akron, CO, 1998.

Western corn rootworm pressure was moderate and uniform throughout the plot area. All planting time treatments were effective. Untreated controls had an average root damage rating of 3.9 (Table 1). There were no cultivation treatments less damaged than the untreated control (Table 2). There was no phytotoxicity observed with any treatment.

Yields could not be determined in 1998 due to hail damage. Yield losses measured between 1987-1996 have averaged 15.8% loss in grain yield, with a range of 0% to 31%. Plots were hand harvested and therefore did not take into account any losses due to lodging.

Field History

Pest:	Western corn rootworm, *Diabrotica virgifera virgifera* LeConte
Cultivar:	Pioneer '3514'
Planting Date:	3 May 1998
Plant Population:	32,000
Irrigation:	Sprinkler
Crop History:	Field corn since 1995
Herbicide:	Atrazine 1.0 lb (AI)/acre, Marksman 2.5 pt/acre
Insecticide:	None prior to experiment
Fertilization:	220 N, 35 P, 1 Zn
Soil Type:	Platner clay loam, OM 1.8%, pH 7.8
Location:	Washington County, SE ¼, Section 10, 2S-52W

Table 1. Planting-time treatments for control of western corn rootworm, Jesse Farm, Akron, CO, 1998.

TREATMENT	RATE[1]	VOLUME	PLACEMENT[2]	ROOT RATING[3]	% EFFICIENCY[4]
COUNTER 20CR	6.0	—	TB	2.5 B	100
AZTEC 2.1G	6.7	—	IF	2.5 B	100
COUNTER 20G	6.0	—	TB	2.5 B	100
REGENT 80WG	0.13*	12Qt	IF MT	2.6 B	100
FORCE 3G	5.0	—	IF	2.6 B	94
COUNTER 20G	6.0	—	TB	2.6 B	100
REGENT 80WG	0.13*	8Qt	IF MT	2.7 B	94
FORCE 3G	5.0	—	TB	2.7 B	100
COUNTER 20G	8.0	—	IF	2.7 B	89
AZTEC 2.1G	6.7	—	TB	2.7 B	94
COUNTER 20G	6.0	—	IF	2.7 B	94
REGENT 80WG	0.06*	4Qt	IF MT	2.7 B	100
FORTRESS 2.5G	6.0	—	TB	2.8 B	89
COUNTER 15G	8.0	—	TB	2.8 B	89
LORSBAN 15G	8.0	—	TB	2.8 B	94
REGENT 80WG	0.13*	4Qt	IF MT	2.9 B	94
THIMET 20G	6.0	—	TB	3.1 B	67
FORTRESS 2.5G	6.0	—	IF	3.1 B	72
UNTREATED	—	—	—	3.9 A	22
UNTREATED	—	—	—	3.9 A	39
F value				7.64	
p > F				< 0.0001	

[1]Ounces per 1000 row, * indicates LB(AI)/Acre
[2]IF, in furrow; TB, t-band; MT, micro-tube.
[3]Iowa 1-6 rootworm damage scale. Means followed by the same letter(s) are not statistically different SNK (a=0.05).
[4]Percentage of 18 plants (total in 6 replicates of treatment) with a rating of 3.0 or less

Table 2. Cultivation treatments for control of western corn rootworm, Jesse Farm, Akron, CO, 1998.

TREATMENT	RATE[1]	PLACEMENT	ROOT RATING[2]	% EFFICIENCY[3]
COUNTER 15G	8.0	BAND	2.5	100
AZTEC 2.1G	6.7	BAND	2.8	78
THIMET 20G	6.0	BAND	2.9	71
COUNTER 20CR	6.0	BAND	2.9	78
FURADAN 4F	1.00*	BROADCAST*	2.9	78
FURADAN 4F	1.00*	BROADCAST**	3.1	67
LORSBAN 15G	8.0	BAND	3.1	50
UNTREATED	—	—	3.5	33
FORCE 3G	5.0	BAND	3.6	39
F value			1.88	
p > F			0.0810	

[1]Ounces per 1000 row, * indicates LB(AI)/Acre
* indicates without cultivation,** indicates with cultivation.
[2] Iowa 1-6 rootworm damage scale.
[3]Percentage of 18 plants (total in 6 replicates of treatment) with a rating of 3.0 or less

CONTROL OF WESTERN CORN ROOTWORM ADULTS AND WESTERN BEAN CUTWORM WITH AERIALLY APPLIED WARRIOR 1E IN 1997 AND WESTERN CORN ROOTWORM LARVAL CONTROL IN 1998, JESSE FARM, AKRON, CO

Dave Kennedy, Stan Pilcher, Golden Plains Area Cooperative Extension; Shawn Walter, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF WESTERN CORN ROOTWORM ADULTS AND WESTERN BEAN CUTWORM WITH AERIALLY APPLIED WARRIOR 1E IN 1997 AND WESTERN CORN ROOTWORM LARVAL CONTROL IN 1998, JESSE FARM, AKRON, CO: Warrior 1E, 0.03 lb (AI)/acre was applied on 10 August 1997 with a Weatherly 802B aircraft, equipped with 32 CP nozzles (deflector set at 0.125) on a 42 ft boom calibrated to apply two gal/acre at 20 psi at an airspeed of 125 mph over an effective swath width of 60 ft. Conditions at the time of application were wind speed less than five mph and 42% relative humidity.

Adult western corn rootworm emergence was monitored by counting the beetles emerging in 7 cages each covering 6 ft^2. At the time of application, 76% of the beetles had emerged and emergence continued until 1 September 1997. Adult western corn rootworm densities were monitored by counting the beetles per plant on six to eight sets of 10 plants. Western bean cutworm were evaluated on 29 August 1997 by counting the number of larvae per ear in five groups of 10 plants each. Yields were not measured in 1998 because the crop was lost to hail.

Western bean cutworm control was excellent (Table 1). The 10 August 1997 application was made prior to western bean cutworm larvae entry into the ear during the pollination period. Fewer western corn rootworm adults were observed in the treated area on each post-treatment sample date.

Both 1997 western corn rootworm treatments and 1998 at-plant treatments had less 1998 larval damage than the untreated control (Table 2). 1997 western corn rootworm adult control diminished due to immigration and late emergence.

Field History:

Pest:	Western corn rootworm, *Diabrotica virgifera virgifera* Leconte
	Western bean cutworm, *Richia albicosta* (Smith)
Cultivar:	Pioneer 3578 (1997); Pioneer 3514 (1998)
Planting date:	3-4 May 1997; 2-3 May 1998
Plant population:	30,000 (1997); 32,000 (1998)
Irrigation:	Sprinkler
Crop History:	Field corn since 1994
Herbicide:	Atrazine 1.0 lb(AI)/acre, Marksman 2.5 pt/acre (1997 and 1998)
Insecticide:	Furadan 4F 1.00 lb(AI)/acre banded 20 June 1997
	Aztec 2.1G at planting time in 1998
Fertilization:	220 N, 35 P, 1 Zn (1997 and 1998)
Soil Type:	Platner Clay Loam, OM 1.6%, pH 7.8
Location:	Washington County, SE ¼, Section 10 2S-52

Table 1. Western corn rootworm adults per plant and western bean cutworm per ear, Jesse Farm, Akron, CO, 1997.

SAMPLE	TREATED	UNTREATED
Western corn rootworm, precount	7.6	7.8
Western corn rootworm, 12 August	0.0	6.6
Western corn rootworm, 19 August	0.4	5.4
Western corn rootworm, 26 August	0.2	0.8
Western bean cutworm, 29 August	0.0	0.4

Table 2. 1998 western corn rootworm damage, Jesse Farm, Akron, CO, 1997-98.

TREATMENT	RATE	IOWA 1-6 ROOT
AZTEC 2.1G (1998)	6.7 oz/acre	2.6 (< 0.0001)
WARRIOR 1E (1997) + AZTEC 2.1G (1998)	0.03 lb(AI)/acre + 6.7 oz/acre	2.7 (< 0.0001)
WARRIOR 1E (1997)	0.03 lb(AI)/acre	3.8 (< 0.0001)
UNTREATED	—	5.4

[1]Number in parenthesis is the probability of being similar to the untreated control, calculated with a two-tailed t-test with assumed equal variance (a=0.05).

CONTROL OF WESTERN CORN ROOTWORM AND EUROPEAN CORN BORER, ARDEC, FORT COLLINS, CO, 1998

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CONTROL OF WESTERN CORN ROOTWORM AND EUROPEAN CORN BORER, ARDEC, FORT COLLINS, CO, 1998: Planting time treatments were applied on 28 April 1998. Each treatment consisted of six replicates of one row by 50 ft plots arranged in a randomized complete block design. Granular insecticides were applied with modified Wintersteiger meters mounted on a two-row John Deere Maxi-Merge planter. In furrow applications were accomplished by directing a drop tube into the seed furrow. T-band applications were made with a four inch John Deere spreader located between the disk openers and the press wheel. Applications were made at 3 mph.

Five consecutive plants in each plot were infested with approximately 132 European corn borer larvae per plant on 3, 5 and 7 July between 6:00 and 7:00 pm. Infestation took place during early evening so that air temperature would be lower to maximize larval survival.

The western corn rootworm treatments were evaluated on 20 July 1998 by digging three plants per plot, washing the roots and rating the damage on the Iowa 1-6 scale (Witkowski, J.F., D.L. Keith, Z.B. Mayo. 1982. Evaluating corn rootworm soil insecticide performance. University of Nebraska Cooperative Extension NebGuide G82-597, 2 pp.). Plot means were subjected to analysis of variance and treatment means were separated by the Student-Neuman-Kuel method (a=0.05).

European corn borer treatments were evaluated on 20 August 1998 by splitting the five infested plants per plot and counting the number of larvae per plant in four areas - stalk above ear insertion, stalk below ear insertion, ear tip and ear shank. Total counts were transformed by the square root + ½ method and then subjected to analysis of variance.

Yields were determined by harvesting twelve plots treated with Counter 20CR and twelve untreated plots (17.5 ft per plot) on 1 October 1998. The grain was shelled, moisture determined and yields converted to bu/acre at 15.5% moisture.

Western corn rootworm pressure was moderate and not uniform across the experiment. All treatments had root ratings below 4.0, the level at which economic losses are thought to become important. The Force treatment was the only treatment with a significantly lower root rating than the untreated control. No treatment controlled European corn borer. This may have been due to the low survival rate of the corn borer larvae on the infested plants. Yields were not significantly affected (two-tailed t-test t=0.9069, df=22, $p(t>t_{.05})=0.3743$) by treatment in this experiment. The average treated yield was 191.3 ± 12.2 bu/acre at 15.5% moisture while the average for the untreated plots was 186.2 ± 15.3 bu/acre at 15.5% moisture. There was no phytotoxicity observed with any treatment.

Field History

Pest:	Western corn rootworm, Diabrotica virgifera virgifera Leconte European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	Pioneer ‘3893'
Planting Date:	28 April 1998
Plant Population:	36,500
Irrigation:	Linear move sprinkler with drop nozzles
Crop History:	Continuous corn, 6 years
Herbicide:	Atrazine 4L 4 pts/acre on 23 June 1998
Insecticide:	None prior to experiment
Fertilization:	100 N on 23 April 1998
Soil Type:	Clay, OM 1.3%, pH 8.2
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (SW corner of Block 1080)

Table 1. Control of western corn rootworm and European corn borer larval damage with planting-time treatments, ARDEC, Fort Collins, CO, 1998

PRODUCT, LB (AI)/ACRE	PLACEMENT[1], EQUIPMENT[2]	VOLUME	RATING[4]	EFFICIENCY[5]	EUROPEAN CORN BORER PER 5 PLANTS ± SEM				
					ABOVE EAR	BELOW EAR	EAR TIP	EAR SHANK	TOTAL
FORCE 3G, 8oz/1000ft	TB, S	—	2.1 B	94	0.0 ± 0.0	0.5 ± 0.3	0.0 ± 0.0	0.0 ± 0.0	0.5 ± 0.3
COUNTER 20CR, 6oz/1000ft	IF, T	—	2.3 AB	100	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
REGENT 4SC, 0.13	IF, MT	8 QT	2.4 AB	100	0.2 ± 0.2	0.2 ± 0.2	0.0 ± 0.0	0.0 ± 0.0	0.3 ± 0.2
AZTEC 2.1G, 6.7oz/1000ft	TB, S	—	2.6 AB	94	0.2 ± 0.2	0.2 ± 0.2	0.0 ± 0.0	0.2 ± 0.2	0.5 ± 0.2
REGENT 80WP, 0.13	IF, MT	8 QT	2.6 AB	83	0.2 ± 0.2	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.2 ± 0.2
COUNTER 20CR, 6oz/1000ft	IF	—	2.7 AB	86	0.0 ± 0.0	0.1 ± 0.1	0.0 ± 0.0	0.1 ± 0.1	0.3 ± 0.2
REGENT 4SC, 0.13	IF, MT	4 QT	2.7 AB	83	0.0 ± 0.0	0.3 ± 0.2	0.0 ± 0.0	0.0 ± 0.0	0.3 ± 0.2
UNTREATED	—	—	2.8 AB	83	0.0 ± 0.0	0.2 ± 0.2	0.0 ± 0.0	0.0 ± 0.0	0.2 ± 0.2
REGENT 4SC, 0.13	IF, MT	16-20 QT[3]	2.8 AB	78	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.2 ± 0.2	0.2 ± 0.2
UNTREATED	—	—	3.0 AB	67	0.3 ± 0.2	0.2 ± 0.2	0.2 ± 0.2	0.2 ± 0.2	0.8 ± 0.3
REGENT 4SC, 0.13	IF, MT	6 QT	3.0 AB	67	0.0 ± 0.0	0.0 ± 0.0	0.2 ± 0.2	0.0 ± 0.0	0.2 ± 0.2
REGENT 4SC, 0.13	IF, MT	12-16 QT	3.1 A	67	0.0 ± 0.0	0.2 ± 0.2	0.0 ± 0.0	0.0 ± 0.0	0.2 ± 0.2
F Value		—	2.12	—	1.62	0.80	0.96	0.73	1.07
p > F		—	0.0329	—	0.1182	0.6415	0.4919	0.7093	0.4039

[1]IF, in furrow; TB, t-band.
[2]MT, microtube; T, drop tube; S, 4 inch spreader.
[3]10-34-0 fertilizer used instead of water.
[4]Iowa 1-6 rootworm damage scale. Means followed by the same letter(s) are not statistically different, SNK (a=0.05).
[5]Percentage of 18 plants (total in 6 replicates of a treatment) with a rating of 3.0 or less.

CONTROL OF EUROPEAN CORN BORER WITH PLANTING AND CULTIVATION APPLICATIONS, DRYDEN FARM, WRAY, CO, 1998

Stan Pilcher, Dave Kennedy, Marion Seward, Golden Plains Area Cooperative Extension; Shawn Walter, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF EUROPEAN CORN BORER WITH PLANTING AND CULTIVATION APPLICATIONS, DRYDEN FARM, WRAY, CO, 1998: Regent 4SC, 0.13 lb(AI)/acre was applied at planting on 13 May 1998 and the other treatments were applied at cultivation on 19 June 1998. Each treatment consisted of four replicates of one row by 60 ft plots arranged in a randomized complete block design. At the time of cultivation plants were six - eight inches in height and in the five leaf stage. The CO_2 powered planting-time applicator was mounted on a two-row John Deere Maxi-Merge planter with a microtube positioned to place the liquid insecticide into the seed furrow ½ inch above the seed. The applicator was calibrated to apply 8 gal/acre at 19 psi. Cultivation applications were made with a CO_2 powered sprayer mounted on the cultivator. Over-whorl applications were made in a 10-inch band with a single 11003 T-Jet nozzle. The sprayer was calibrated to apply 23.3 gal/acre at 30 psi.

Twelve plants in each plot were infested with approximately 30-1st instar European corn borer larvae per plant on 30 June and again on 7 July 1998 using a Davis insect inoculator (“bazooka”). Extended leaf height was approximately 36 inches and 45 inches on these two dates.

All European corn borer treatments were evaluated on 10 August 1998 by splitting the 12 infested plants from each plot and counting the numbers of 5th instar larvae, pupae and cavities. Insect counts were subjected to analysis of variance and means were separated by the Student-Neuman-Keul method (a=0.05).

All treatments provided similar control of European corn borer (Table 1). We previously had not observed control of this pest with planting-time applications of other formulations of Regent.

Field History

Pest:	European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	Golden Harvest ‘2493'
Planting Date:	13 May 1998
Plant Population:	32,000
Irrigation:	Sprinkler
Crop History:	Continuous corn,11 years
Herbicide:	Prowl 3.5 pt/acre, Atrazine 2.0 (AI)/acre
Insecticide:	None prior to experiment
Fertilization:	250 N, 91 P, 17 S
Soil Type:	Sandy loam, OM 1.4%, pH 6.8
Location:	Yuma County, CO, SE ¼, Section 18, 4N, 43W

Table 1. Control of first generation European corn borer with planting-time and cultivation insecticide applications, Dryden Farm, Wray, CO, 1998.

TREATMENT, LB (AI)/ACRE	PLACEMENT[1]	LARVAE PER PLANT[2]	% CONTROL
FURADAN 4F, 1.0 No incorporation	OW	0.0 B	100
REGENT 4SC, 0.04	OW	0.0 B	100
REGENT 4SC, 0.05	OW	0.0 B	94
REGENT 4SC, 0.06	OW	0.0 B	89
REGENT 4SC, 0.13	IF	0.0 B	89
FURADAN 4F, 1.0	OW	0.1 B	83
UNTREATED CONTROL	—	0.4 A	—
F Value		3.404	
p > F		0.0210	

[1] OW, applied over the whorl. IF, applied in furrow
[2]Means in the same column followed by the same letter(s) are not statistically different, SNK (a=0.05).

CONTROL OF SECOND GENERATION EUROPEAN CORN BORER WITH HAND-APPLIED INSECTICIDES, DRYDEN FARM, WRAY, CO, 1998

Stan Pilcher, Dave Kennedy and Marion Seward, Golden Plains Area Cooperative Extension; Shawn Walter, Frank Peairs, Department of Bioagricultural Sciences and Pest Management.

CONTROL OF SECOND GENERATION EUROPEAN CORN BORER WITH HAND-APPLIED INSECTICIDES, DRYDEN FARM, WRAY, CO, 1998: Treatments were applied on 12 August 1998 with a CO_2 powered back-pack sprayer calibrated to deliver 44 gal/acre at 30 psi through three nozzles (TXVS-8 Cone Jet). Two nozzles were located on 15 inch drops, 30 inches apart, with a single nozzle centered on the main boom. The spray boom was held at tassel height during the application with all nozzles directed at a single plant in row. Plots were two rows by 50 ft separated by a single buffer row arranged in four replicates of a randomized complete block design. At the time of application the accumulated egg mass count was 45% plants infested with egg masses. On the treatment date, 80% of these egg masses were either at the blackhead stage or hatched but no larvae were found in the ear tips.

Treatments were evaluated on 24 September 1998 by splitting 10 consecutive plants per plot and counting the number of 5^{th} instar larvae, pupae and/or fresh cavities. Larval counts were recorded by location on the plant (stalk above ear insertion, stalk below ear insertion, ear shank and ear tip). Counts were subjected to analysis of variance and mean separation by the Student-Neuman-Keul method (a=0.05).

All treatments controlled second generation European corn borer, but there were no differences among treatments (Table 1). The distribution of larvae on hand treated plants versus plants treated by chemigation is shown in Table 2. No phytotoxicity was observed with any treatment.

Field History

Pest:	European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	Pioneer 34K 77
Planting Date:	13 May 1998
Plant Population:	33,000
Irrigation:	Sprinkler
Crop History:	Continuous corn, 11 years
Herbicide:	Prowl (2.0 pts/acre), Basis Gold (14 oz/acre), Tough (1.5 pts/acre)
Insecticide:	None prior to experiment
Fertilization:	250 N, 91 P, 24 K, 17 S
Soil Type:	Sandy Loam, OM 1.4%, pH 6.8
Location:	Yuma County, CO, SE ¼, Section 18, 4N 43W

Table 1. Control of second generation European corn borer with hand-applied insecticides, Dryden Farm, Wray, CO, 1998.

TREATMENT, LB (AI)/ACRE	LARVAE/PLANT[1]	% CONTROL
WARRIOR 1E, 0.03	0.1 ± 0.0 B	96
WARRIOR IE, T, 0.03	0.2 ± 0.1 B	85
WARRIOR IE, T, 0.02	0.2 ± 0.2 B	85
TD-2344-02, 0.04	0.2 ± 0.1 B	83
POUNCE 3.2E, 0.15	0.4 ± 0.2 B	74
POUNCE 3.2E, 0.20	0.4 ± 0.2 B	70
WARRIOR 1E, 0.02	0.4 ± 0.1 B	70
TD-2351-01, 0.75	0.5 ± 0.1 B	67
CAPTURE 2.0E, 0.08	0.5 ± 0.3 B	61
TD-2351-01, 0.50 + TD-2344-02, 0.03	0.7 ± 0.4 B	46
UNTREATED	1.4 ± 0.1 A	0
F Value	2.97	—
p > F	0.0093	—

[1]Means in the same column followed by the same letter(s) are not statistically different, SNK (α = 0.05).

Table 2. Control of second generation European corn borer by plant zone comparing chemigated and hand-applied treatments, Dryden Farm, Wray, CO, 1998.

	TOTAL IN 40 PLANTS			
	ABOVE EAR	**EAR TIP**	**EAR SHANK**	**BELOW EAR**
CHEMIGATED				
TREATED	18	61	15	66
UNTREATED	56	20	11	66
HAND PLOTS				
TREATED	12	28	22	79
UNTREATED	25	11	4	33

CHEMIGATED AND AERIALLY-APPLIED INSECTICIDES FOR CONTROL OF SECOND GENERATION EUROPEAN CORN BORER AND WESTERN BEAN CUTWORM, DRYDEN FARM, WRAY, CO, 1998

Stan Pilcher, Dave Kennedy, Marion Seward, Golden Plains Area Cooperative Extension; Shawn Walter, Frank Peairs, Department of Bioagricultural Sciences and Pest Management.

CHEMIGATED AND AERIALLY-APPLIED INSECTICIDES FOR CONTROL OF SECOND GENERATION EUROPEAN CORN BORER AND WESTERN BEAN CUTWORM, DRYDEN FARM, WRAY, CO, 1998: Chemigation treatments were applied on the East and West Dryden fields on 13 and 21 August 1998, respectively, with a Milton Roy - Model B chemigation pump through Lockwood sprinklers equipped with Senninger 360E nozzles on 18 inch drops. All insecticides were diluted at the rate of 0.28 gallons of water per acre and applied in less than 0.5 inch irrigation water per acre. Plots were 10.65 acres.

Fifty percent of the West Dryden field was treated aerially on 22 August 1998 with a Grumman Ag Cat Model G164A aircraft calibrated to apply 2 gpa over a 55 ft effective swath through 30 CP nozzles, 0.095 orifice size set at 90° shear, at 26 psi and an airspeed of 115 mph. Conditions were temperature 84°F, relative humidity 45% and SW winds less than 5 mph at the time of treatment. Plots were three or more swath widths by the length of the field.

The second generation European corn borer infestation level in the East field at the time of application was an accumulated 45% of plants with egg masses. The infestation level in the West field at the time of application was an accumulated 32%. On the day of treatment, 80% of these egg masses were at the blackhead stage or hatched but no live larvae were found in ear tips in either field.

Second generation treatments were evaluated on 24 September 1998 by splitting six groups of 10 plants per plot and counting the number of 5^{th} instar larvae, pupae and/or fresh cavities per plant. Counts were recorded by location on the plant (above ear insertion, below ear insertion, ear shank cavities and ear tip tunneling). Data from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (a=0.05).

Control of western bean cutworm was evaluated on the East Field on 25 August 1998 by counting larvae per primary ear in five groups of 10 consecutive plants per plot. Larvae were 3^{rd} to 5^{th} instar at application and evaluation. This was done to determine the effect of properly timed second generation European corn borer treatments on subeconomic western bean cutworm infestations that have passed the optimum treatment timing. Untreated plots averaged only 0.38 western bean cutworm larvae per plant and the larvae had already entered the ear. Optimally, western bean cutworm treatments are applied prior to larval entry into the ear, which allows lower insecticide rates, ensures >90% had control and prevents feeding damage. However, in some previous 2^{nd} generation European corn borer experiments, we have observed some degree of western bean cutworm control with high rates of permethrin.

All treatments controlled second generation European corn borer at both locations (Tables 1 and 2). Only the two chemigated Pounce 3.2E treatments controlled western bean cutworm larvae (Table 2). Aerial and chemigation treatments at the West location and chemigation treatments at the East location provided similar second generation European corn borer control by plant zone (Table 3).

Field History

Pest: European corn borer, *Ostrinia nubilalis* (Hübner)
Western bean cutworm, *Richia albicosta* (Smith)

	EAST FIELD	WEST FIELD
Cultivar:	Pioneer 34K 77	Golden Harvest 2547
Planting Date:	13 May 1998	15 May 1998
Plant Population:	33,000	33,000
Irrigation:	Sprinkler (Lockwood)	Sprinkler (Lockwood)
Crop History:	Continuous corn 11 yrs	First year corn
Herbicide:	2.0 pints/ac Prowl, 14 oz/ac Basis Gold, 1.5 pt/ac Tough	3.5 pt/ac Prowl, 2.0 lb(AI)/ac Atrazine
Insecticide:	None prior to experiment	None prior to experiment
Fertilization:	250 N, 91 P, 24 K, 17 S	250 N, 91 P, 24 K, 17 S
Soil Type:	Sandy Loam, OM 1.4%, pH 6.8	Sandy Loam, OM 1.4%, pH 6.8
Location:	Yuma County, CO, SE ¼, Section 18, 4N 43W	Yuma County, CO, SW ¼, Section 1, 2N 53W

Table 1. Control of second generation European corn borer with aerially applied insecticides, Dryden Farm - West, Wray, CO, 1998.

PRODUCT, LB (AI)/ACRE	LARVAE PER PLANT[1]	% CONTROL
AERIAL - DRYDEN WEST		
CAPTURE 2E, 0.08	0.2 ± 0.1 (< 0.0001)	85
WARRIOR IE, T, 0.03	0.3 ± 0.1 (< 0.0001)	81
POUNCE 3.2E, 0.15	0.3 ± 0.0 (< 0.0001)	79
WARRIOR IE, T, 0.02	0.4 ± 0.1 (< 0.0001)	71
UNTREATED	1.3 ± 0.1	0
CHEMIGATED - DRYDEN WEST		
WARRIOR IE, T, 0.03	0.7 ± 0.3 (< 0.0001)	90
WARRIOR IE, T, 0.02	1.8 ± 0.7 (0.0002)	74
UNTREATED	6.8 ± 0.5	0

[1]Number in parenthesis is the probability of being similar to the untreated control, calculated with a two-tailed t-test with assumed equal variance (a=0.05).

Table 2. Control of second generation European corn borer and western bean cutworm with chemigated insecticides, Dryden Farm - East, Wray, CO, 1998.

	WBC	ECB	
PRODUCT , LB (AI)/ACRE	LARVAE/PLANT[1]	LARVAE/PLANT[1]	% CONTROL
POUNCE 3.2E, 0.20	0.2 ± 0.2 (0.0190)	0.2 ± 0.1 (< 0.0001)	87
WARRIOR IE, T, 0.03	0.9 ± 0.3(0.9064)	0.3 ± 0.1 (< 0.0001)	78
CAPTURE 2E, 0.08	0.7 ± 0.1 (0.1627)	0.4 ± 0.1 (< 0.0001)	73
WARRIOR 1E, 0.03	0.8 ± 0.1 (0.6253)	0.4 ± 0.1 (< 0.0001)	71
WARRIOR 1E, 0.02	0.7 ± 0.3 (0.4782)	0.5 ± 0.1 (0.0004)	63
POUNCE 3.2E, 0.15	0.3 ± 0.1 (0.0090)	0.5 ± 0.1 (0.0010)	61
WARRIOR IE, T, 0.02	1.0 ± 0.1 (0.5995)	0.5 ± 0.1 (0.0011)	58
UNTREATED	0.9 ± 0.1	1.3 ± 0.1	0

[1]Number in parenthesis is the probability of being similar to the untreated control, calculated with a two-tailed t-test with assumed equal variance (a=0.05).

Table 3. Location of second generation European corn borer larvae by plant zone in treated and untreated plots for chemigated versus aerial test plots.

	ABOVE EAR	EAR TIP	EAR SHANK	BELOW EAR
AERIAL-WEST				
TREATED	6	32	2	27
UNTREATED	21	28	10	21
CHEMIGATED-WEST				
TREATED	0	7	2	6
UNTREATED	4	15	12	10
CHEMIGATED-EAST				
TREATED	18	61	15	66
UNTREATED	56	20	11	66

COMPARISON OF EUROPEAN CORN BORER CONTROL WITH REPLICATED Bt AND NON-Bt HYBRIDS, DRYDEN FARM, WRAY, CO and WACKER FARM, YUMA, CO, 1998

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COMPARISON OF EUROPEAN CORN BORER CONTROL WITH REPLICATED Bt AND NON-Bt HYBRIDS, DRYDEN FARM, WRAY, CO and WACKER FARM, YUMA, CO, 1998: Planting was accomplished at the Dryden farm on 16 May 1998 with a John Deer Maxi Merge 7000 planter equipped with Carter Manufacturing Company test plot finger units and a variable plant hydraulic drive system. Each treatment consisted of three replicates of four row by 80 ft plots arranged in a randomized complete block design. The Dryden farm experiment was located within a 138 acre, sprinkler irrigated field planted to Pioneer 3417 on 14 and 15 May 1998. The experimental field was the last to be planted in a cluster of five fields in order to maximize recruitment of second generation European corn borer. The same planter was used to plant the same hybrids in unreplicated four-row strips running the length of the field at the Richard Wacker farm north of Yuma on 28 and 29 April 1998 with the exception of the Wilson 1210Bt and 1436Bt hybrids which were planted on 12 May 1998.

Hybrids were evaluated for European corn borer damage on 24 September 1998 by splitting 10 consecutive plants in each plot and recording the number of first generation cavities and fresh second generation cavities, larvae and/or pupae. Second generation larvae were recorded by location on the plant (above ear, below ear, ear shank and ear tip). Western bean cutworm was evaluated on 25 August 1998 by opening the ear tip and counting the number of larvae on 60 consecutive plants in each plot. Results of the evaluations at the Wacker farm are not presented because of low pest abundance; less than 5% of the plants were infested with European corn borer on a non-Bt variety. Insect counts from the Dryden location were subjected to analysis of variance mean separation by the Student-Neuman-Keul method (a=0.05).

Yields were measured at the Dryden farm plots on 5 November 1998 by hand-harvesting 17.5 ft of the center two rows of each plot. Harvested ears were shelled and moisture and test weight determined. Yields were then converted to bu/acre at 15.5% moisture. Plant population, ear height and percent lodging were determined at harvest.

Yields were measured at the Wacker farm plots on 15 November 1998 with a John Deere 6600 four row combine equipped with a Carter Manufacturing Company scale, moisture tester and test weight device. Row length was hand measured. Plant population, ear height and percent lodging were determined at harvest.

All Bt hybrids at the Dryden farm location had less second generation European corn borer damage than the non-Bt hybrids, Garst 8366IT and Pioneer 3559 (Table 1). First generation damage was too low to allow meaningful comparisons of Bt and non-Bt hybrids (Table 2). The use of Bt hybrids did not control western bean cutworm (Table 2). Yield of the treatments differed significantly. The Garst 8366IT non-Bt variety had the lowest mean yield but was not significantly different from several of the Bt varieties. The Pioneer 3559 non-Bt variety was not significantly different in yield than many of the Bt varieties (Table 3). Varieties and their respective Bt insertion events are listed in Table 4.

The number of European corn borers per plant was much higher in non-Bt varieties as compared with Bt varieties. The insertion event of the Bt gene in the variety did not appear to have a large effect on European corn borer numbers (Figure 3). Western bean cutworm numbers appeared unaffected by Bt regardless of insertion event (Figure 4). Yields at the Wacker farm location looked unaffected by Bt insertion event (Figure 2) but the yields at the Dryden farm varied by the insertion event (Figure 1). At the Dryden farm, all events with the exception of the Star Link variety, yielded more than the non-Bt varieties (Figure 3).

Field History

Pest: European corn borer, *Ostrinia nubilalis*, (Hübner)
Western bean cutworm, *Richia albicosta*, (Smith)

	DRYDEN	**WACKER**
Planting Date:	15 May 1998	29 April 1998
Plant Population:	33,000	32,000
Irrigation:	Sprinkler/Lockwood Rotators	Sprinkler/Valley Rotators
Crop History:	Continuous corn 5 years	Continuous corn 5 years
Herbicide:	3.5 Ag Prowl 2.0 lb(ai)/acre Atrazine	16 oz Tough 14 oz Basis Gold
Insecticide:	None	Capture 0.08 lb(ai)/acre for corn rootworm beetle, 20 July 1998
Fertilization:	250 N, 91 P, 24 K, 17 S	240 N, 72 P, 20 K, 20 S, 1.75 Zn
Soil Type:	Sandy loam, OM 1.4%, pH 6.8	Sandy loam, OM 1.5%, pH 6.4
Location:	Yuma County, CO, SE ¼, Sec 18 4N, 43W	Yuma County, CO, SW ¼, Sec 11, 2N, 48W

Table 1. Comparison of second generation European corn borer control with replicated Bt and non-Bt hybrids, Dryden farm, Wray, CO, 1998.

	2nd GENERATION ECB ± SEM[1]				
TREATMENT	**ABOVE EAR**	**BELOW EAR**	**EAR TIP**	**EAR SHANK**	**TOTAL**
WILSON 1436BT	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.0 ± 0.0 B
WILSON 1210BT	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.0 ± 0.0 B
PIONEER 34A14PDF	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.0 ± 0.0 B
PIONEER 34T14PDR	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.0 ± 0.0 B
GARST 8550BT	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.0 ± 0.0 B
DEKALB CR8671BTY	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.0 ± 0.0 B
DEKALB 580BTY	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.0 ± 0.0 B
CARGILL 5021BT	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.0 ± 0.0 B
PIONEER 34A03	0.0 ± 0.0 C	0.0 ± 0.0 C	0.1 ± 0.1 B	0.0 ± 0.0 B	0.1 ± 0.1 B
CARGILL 4220BT	0.1 ± 0.1 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.1 ± 0.1 B
GARST 8366BTLL	0.0 ± 0.0 C	0.1 ± 0.1 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.1 ± 0.1 B
GOLDEN HARVEST EX8478BT	0.0 ± 0.0 C	0.1 ± 0.1 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.1 ± 0.1 B
GOLDEN HARVEST EX8665BT	0.0 ± 0.0 C	0.1 ± 0.1 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.1 ± 0.1 B
DEKALB 545BTY	0.0 ± 0.0 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.1 ± 0.1 B	0.1 ± 0.1 B
DEKALB 493BTX	0.2 ± 0.2 C	0.0 ± 0.0 C	0.0 ± 0.0 B	0.0 ± 0.0 B	0.2 ± 0.2 B
DEKALB 566BTX	0.0 ± 0.0 C	0.3 ± 0.2 C	0.0 ± 0.0 B	0.1 ± 0.1 B	0.4 ± 0.2 B
GARST 8366IT	0.8 ± 0.3 B	0.9 ± 0.3 B	0.4 ± 0.2 A	0.7 ± 0.3 A	2.8 ± 0.9 A
PIONEER 3559	1.7 ± 0.4 A	1.3 ± 0.5 A	0.0 ± 0.0 B	0.4 ± 0.2 AB	3.4 ± 0.7 A
F Value	9.61	5.57	2.88	3.59	12.43
p > F	< 0.0001	< 0.0001	0.0003	< 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, SNK (a=0.05).

Table 2. Comparison of first generation European corn borer and western bean cutworm control with replicated Bt and non-Bt hybrids, Dryden farm, Wray, CO, 1998.

TREATMENT	**1st GENERATION ECB ± SEM[1]**	**WESTERN BEAN CUTWORM ± SEM[1]**
WILSON 1436BT	0.0 ± 0.0	12.7 ± 1.8
WILSON 1210BT	0.0 ± 0.0	9.0 ± 2.1
PIONEER 34A14PDF	0.0 ± 0.0	5.0 ± 0.6
PIONEER 34T14PDR	0.0 ± 0.0	11.7 ± 4.3
GARST 8550BT	0.1 ± 0.1	12.0 ± 4.5
DEKALB CR8671BTY	0.0 ± 0.0	15.3 ± 4.4

TREATMENT	1st GENERATION ECB ± SEM[1]	WESTERN BEAN CUTWORM ± SEM[1]
DEKALB 580BTY	0.0 ± 0.0	9.7 ± 2.0
CARGILL 5021BT	0.0 ± 0.0	16.0 ± 11.1
PIONEER 34A03	0.0 ± 0.0	14.7 ± 3.0
CARGILL 4220BT	0.0 ± 0.0	12.3 ± 5.5
GARST 8366BTLL	0.1 ± 0.1	11.0 ± 4.0
GOLDEN HARVEST EX8478BT	0.1 ± 0.1	25.3 ± 5.2
GOLDEN HARVEST EX8665BT	0.0 ± 0.0	6.3 ± 1.8
DEKALB 545BTY	0.2 ± 0.2	9.7 ± 5.2
DEKALB 493BTX	0.1 ± 0.1	6.3 ± 2.0
DEKALB 566BTX	0.2 ± 0.2	17.7 ± 13.2
GARST 8366IT	0.1 ± 0.1	7.7 ± 2.0
PIONEER 3559	0.1 ± 0.1	19.0 ± 3.8
F Value	0.97	0.94
p > F	0.4916	0.5390

[1]SEM, standard error of the mean.

Table 3. Comparison of yields of replicated Bt and non-Bt hybrids, Dryden farm, Wray, CO and Wacker farm, Yuma, CO, 1998.

	YIELD	
TREATMENT	DRYDEN[1]	WACKER[2]
GARST 8550BT	211.9	192.7
PIONEER 34A14PDF	210.2	219.6
PIONEER 34T14PDR	207.1	228.2
DEKALB 566BTX	194.1	185.6
DEKALB 580BTY	192.9	191.8
PIONEER 34A03	190.7	197.6
GOLDEN HARVEST EX8665BT	185.5	190.1
CARGILL 4220BT	184.3	215.5
PIONEER 3559	183.7	193.0
WILSON 1210BT	183.6	169.4
DEKALB CR8671BTY	181.1	—
GOLDEN HARVEST EX8478BT	179.7	207.3

TREATMENT	YIELD	
	DRYDEN[1]	WACKER[2]
WILSON 1436BT	176.2	167.1
DEKALB 545BTY	173.1	176.3
DEKALB 493BTX	170.7	196.7
CARGILL 5021BT	168.0	180.4
GARST 8366BTLL	164.7	182.7
GARST 8366IT	154.4	190.3
Average Yield	184.5	193.2
Coefficient of Variation	8.00	—
LSD (a=0.05)	16.913	—
p > F	< 0.0001	—

[1]SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not statistically different, SNK (a=0.05).
[2]Wacker trial not replicated.

Table 4. Variety numbers and events for Bt hybrids.

COMPANY	VARIETY NUMBER	SEASON (DAYS)	EVENT	PROTEIN	TRADE NAME
CARGILL	4220BT	104	MON 810	CRY 1 AB	YIELD GUARD
CARGILL	5021BY	106	MON 810	CRY 1 AB	YIELD GUARD
DEKALB	DK 493BTX	99	DBT 418	CRY 1 AB	BT EXTRA
DEKALB	DK 545BTY	104	MON 810	CRY 1 AB	YIELD GUARD
DEKALB	DK 566BTX	106	DBT 418	CRY 1 AC	BT EXTRA
DEKALB	DK 580BTY	108	MON 810	CRY 1 AB	YIELD GUARD
DEKALB	CR8671BTY	108	MON 810	CRY 1 AB	YIELD GUARD
GARST	8850BT	109	MON 810	CRY 1 AB	YIELD GUARD
GARST	8366BT/LL	113	CBH 351	CRY 9 C	STAR LINK
GARST	8366IT	113	NON Bt	—	IMI-CORN
GOLDEN HARVEST	EX 8665BT	104	MON 810	CRY 1 AB	YIELD GUARD
GOLDEN HARVEST	EX 8478BT	114	MON 810	CRY 1 AB	YIELD GUARD
PIONEER	3559	103	NON Bt	—	—
PIONEER	34 A03	107	MON 810	CRY 1 AB	YIELD GUARD
PIONEER	33 A14	113	MON 810	CRY 1 AB	YIELD GUARD
PIONEER	34 T14	110	MON 810	CRY 1 AB	YIELD GUARD
WILSON	1210BT	102	MON 810	CRY 1 AB	YIELD GUARD
WILSON	1436BT	108	MON 810	CRY 1 AB	YIELD GUARD

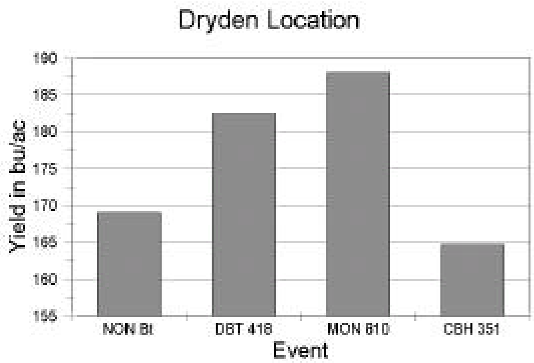

Figure 1
Corn Yield by Bt Event, Dryden Farm, Wray, CO, 1998.

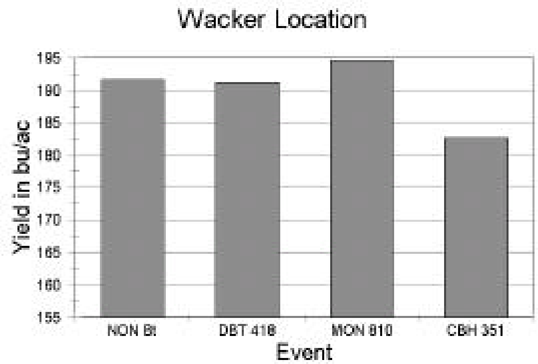

Figure 2
Corn Yield by Bt Event, Wacker Farm, Yuma, CO, 1998.

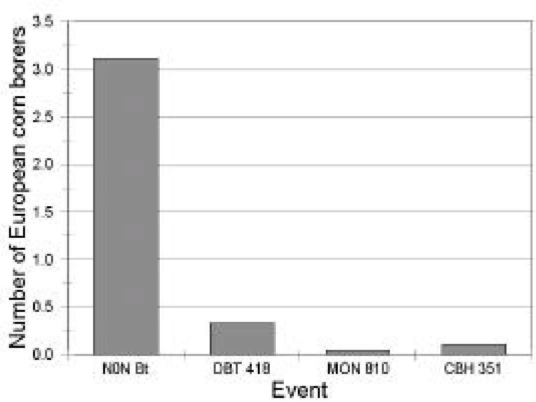

Figure 3
Average Number of European Corn Borers per Plant by Bt Event, Dryden Farm, Wray, CO, 1998.

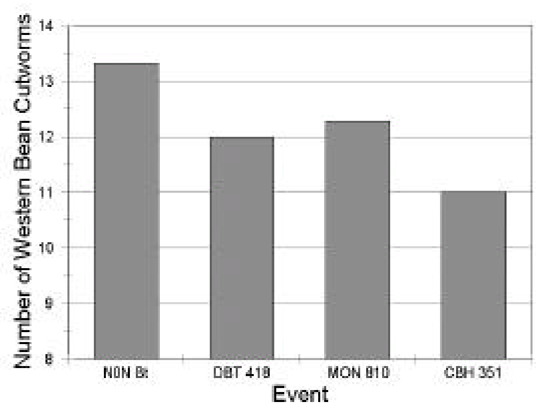

Figure 4
Number of Western Bean Cutworm Larvae per 60 Plants by Bt Event, Dryden Farm, Wray, CO, 1998.

CONTROL OF WESTERN BEAN CUTWORM WITH CHEMIGATED INSECTICIDES, GARDNER FARM, ECKLEY, CO 1998

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CONTROL OF WESTERN BEAN CUTWORM WITH CHEMIGATED INSECTICIDES, GARDNER FARM, ECKLEY, CO 1998: Treatments were applied on 3 August 1998 at 0.4 inches of water/acre through a Lockwood sprinkler equipped with Nelson 360E nozzles on 4 ft drops. The unreplicated plots were 7.15 acres each. Treatments were injected at a rate of 42 fl oz/acre. Applications were timed for optimum western bean cutworm control (after egg hatch but before larvae were found in the ear tips).

Treatments were evaluated on 20 August 1998 by counting the number of western bean cutworm larvae in the ears of ten groups of ten plants per plot. The field received hail twice making it impossible to obtain yield.

Western bean cutworm counts from treated plots were compared to those of the untreated control using a two-tailed t-test with assumed equal variance (a=0.05). Percent control was calculated by Abbot's formula.

The intent of this study was to compare two formulations of lambda cyhalothrin (Warrior 1E and Warrior T) for western bean cutworm control and to determine the lowest effective rate of these products. All treatments provided excellent control (Table 1) because of proper treatment timing, i.e., treatments should be applied before the larvae have entered the ear. Further experiments would be necessary to determine if there is a difference between the two Warrior formulations and if a rate lower than 0.008 lb (AI)/acre would be effective against this pest.

Field History

Pest:	Western bean cutworm, *Richia albicosta* (Smith)
Cultivar:	Pioneer GH2377
Planting Date:	4 May 1998
Plant Population	32,000
Irrigation:	Sprinkler
Sprinkler Type:	Lockwood
Nozzles:	Nelson Drop Nozzles (Nelson 360E Rotors)
Drops:	4 ft
Crop History:	Continuous corn, 5 years
Herbicide:	1.25 pt/acre Bicep, 0.50 pt/acre Dual, 0.25 pt/ac Bladex
Insecticide:	None prior to experiment
Fertilization:	205 N, 47 P, 9 K, 8 S, 2.5 Zn
Soil Type:	Valentine sandy loam, OM 1.0%, pH 6.5
Location:	Yuma County, NE ¼, Section 6, 50 W

Table 1. Control of western bean cutworm with chemical insecticides, Gardner Farm, Eckley, CO, 1998.

TREATMENT, LB (AI)/ACRE	LARVAE/100 PLANTS[1]	% CONTROL
WARRIOR IE, T, 0.008	3*	95
WARRIOR IE, T, 0.012	0*	100
WARRIOR IE, T, 0.02	4*	93
WARRIOR 1E, 0.012	2*	96
WARRIOR 1E, 0.008	0*	100
WARRIOR 1E, 0.02	1*	98
CAPTURE 2E, 0.075	1*	98
WARRIOR IE, T, 0.03	3*	95
UNTREATED CONTROL (average of two plots)	58	—

[1]Means comparted to the untreated control according to two-tailed t-test with assumed equal variance (a=0.05). Means followed by * are statistically different from the untreated control.

CONTROL OF CORN SPIDER MITES WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1998

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CONTROL OF CORN SPIDER MITES WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1998: Each treatment consisted of four replicates of 25 ft by two-row (30 inch centers) plots, arranged in a randomized complete block design. Plots were separated from neighboring plots by a single buffer row. Plots were infested on 14 July 1998 by laying mite infested corn leaves, which had been collected that morning at Fruita, CO, across the lower leaves of the corn plants on which mites were to be counted. On 10 July 1998, the experimental area was treated with Pounce, 0.15 lb AI/acre to control beneficial insects and to encourage buildup of spider mite densities. Treatments were applied using a 2 row boom sprayer mounted on a backpack calibrated to deliver 17.8 gal/acre at 30 psi with two 8002VS drop nozzles per row. Very early treatments (Table 1) were applied on 15 July 1998. Conditions were clear with calm winds and air temperature of 80EF. Early treatments were applied on 22 July 1998. Conditions were cloudy with 5 mph north winds and air temperature of 65EF. Late treatments were applied on 29 July 1998. Conditions were partly cloudy with calm winds and air temperature of 74EF. Treatment effects were evaluated by counting all mites on three leaves (ear leaf, 2nd leaf above the ear, 2nd leaf below the ear) from each of five infested plants per plot for a total of 15 leaves per plot. Precounts were made on 28 July 1998 (0=15 mites per leaf) for all treatments.

Mite counts were transformed by the square root + ½ method and total mite days (calculated by the method of Ruppel, J. Econ. Entomol. 76: 375-377) were transformed by the log + 1 method prior to analysis of variance and means separation by the Student-Neuman-Keul method (a=0.05). Original means are presented in the tables. Reductions in mite days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100). Original mite counts at one, two and three weeks after the precounts and mite days accumulated are presented in Table 1.

There was no phytotoxicity observed with any treatment. Mite densities were moderate and highly variable probably due to post treatment precipitation. Only two Savey treatments reduced the total number of mite days.

Field History

Pest:	Banks grass mite, *Oligonychus pratensis* (Banks)
Cultivar:	Pioneer '38B22'
Planting Date:	28 April 1998
Plant Population:	36,500
Irrigation:	Linear move sprinkler with drop nozzles
Crop History:	Continuous corn 6 years
Herbicide:	Liberty 28 fl oz/acre on 19 June 1998, Atrazine 4L 4 pts/acre on 23 June 1998
Insecticide:	Counter 20 CR 1.3 lb (AI)/acre at planting, Pounce 0.15 lb AI/acre 10 July 1998
Fertilization:	100 N on 23 April 1998
Soil Type:	Clay, OM 1.3%, pH 8.2
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (Block 1080)

Table 1. Control of corn spider mites with hand-applied insecticides, ARDEC, Fort Collins, CO, 1998.

PRODUCT, LB (AI)/ACRE	TREATMENT TIMING	MITES PER 3 LEAVES ± SEM[1]			TOTAL MITE DAYS	% REDUCTION[2]
		1 WEEK	2 WEEKS	3 WEEKS		
SAVEY 50WP, 0.062	VERY EARLY	4.0 ± 0.8	5.7 ± 1.9	17.1 ± 2.2 A	200.0 ± 34.5 AB	94
SAVEY 50WP, 0.094	VERY EARLY	15.6 ± 13.0	3.1 ± 1.9	12.9 ± 6.0 A	240.1 ± 154.1 B	92
SAVEY 50WP + DIMETHOATE 4E, 0.062 + 0.50	EARLY	12.7 ± 4.5	19.5 ± 11.3	40.2 ± 16.6 A	570.3 ± 174.7 AB	82
COMITE II 6E, 2.53	EARLY	11.4 ± 7.2	13.9 ± 3.5	91.6 ± 13.3 A	666.6 ± 95.7AB	79
COMITE II 6E + DIMETHOATE 4E, 1.69 + 0.50	EARLY	18.5 ± 6.8	25.5 ± 14.6	104.9 ± 82.3 A	793.6 ± 385.7 AB	75
CAPTURE 2E, 0.08	LATE	16.6 ± 2.4	73.2 ± 57.9	101.9 ± 33.8 A	1107.6 ± 483.8 AB	65
DIMETHOATE 4E, 0.50	LATE	19.5 ± 6.7	67.2 ± 17.7	128.1 ± 32.3 A	1196.8 ± 267.6 AB	62
COMITE II 6E + DIMETHOATE 4E, 2.53 + 0.50	EARLY	25.6 ± 9.1	63.3 ± 32.8	121.7 ± 52.9 A	1217.1 ± 509.8 AB	61
CAPTURE 2E + DIMETHOATE 4E, 0.08 + 0.50	LATE	43.4 ± 31.4	60.1 ± 42.4	87.0 ± 28.0 A	1254.8 ± 625.9 AB	60
SAVEY 50WP, 0.0125	VERY EARLY	34.6 ± 25.7	92.7 ± 70.4	143.0 ± 73.3 A	1529.9 ± 887.9 AB	51
COMITE II 6E, 1.69	EARLY	21.1 ± 7.9	93.5 ± 48.3	207.6 ± 112.5 A	1640.3 ± 778.4 AB	48
FURADAN 4F + DIMETHOATE 4E, 1.00 + 0.50	LATE	48.8 ± 35.3	86.6 ± 39.0	138.6 ± 51.1 A	1644.7 ± 690.4 AB	48
FURADAN 4F, 1.00	LATE	21.5 ± 8.8	103.4 ± 69.0	185.5 ± 43.4 A	1698.6 ± 569.4 AB	46
TD-2383 5L (cyhexatin), 0.75 (COMITE)	EARLY	46.9 ± 16.0	90.9 ± 38.3	312.1 ± 137.2 A	2231.4 ± 840.4 AB	29
TD-2383 5L (cyhexatin), 1.25 (COMITE)	EARLY	53.8 ± 12.7	124.6 ± 57.0	353.3 ± 209.9 A	2634.3 ± 1206.5 AB	16

PRODUCT, LB (AI)/ACRE	TREATMENT TIMING	MITES PER 3 LEAVES ± SEM[1] 1 WEEK	2 WEEKS	3 WEEKS	TOTAL MITE DAYS	% REDUCTION[2]
TD-2383 5L (cyhexatin), 1.25 (CAPTURE)	LATE	53.9 ± 15.0	139.5 ± 81.4	332.1 ± 120.2 A	2659.1 ± 1082.4 AB	16
TD-2351-02 4F, 0.75	LATE	51.6 ± 18.6	153.4 ± 52.2	347.4 ± 165.6 A	2866.5 ± 1071.2 A	9
UNTREATED	—	42.4 ± 4.9	175.3 ± 37.9	418.4 ± 179.0 A	3147.4 ± 559.0 A	—
TD-2383 5L (cyhexatin), 0.75 (CAPTURE)	LATE	42.8 ± 16.9	182.6 ± 110.8	418.0 ± 233.0 A	3209.0 ± 1683.4 AB	-2
TD-2344 0.08E, 0.04	LATE	47.7 ± 29.6	206.8 ± 155.7	643.3 ± 386.2 A	4194.8 ± 2634.2 AB	-33
F Value		1.43	1.42	1.87	2.18	
p > F		0.1520	0.1551	0.0356	0.0122	

[1]SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not statistically different, SNK (a=0.05).
[2]Percent reduction in total mite days, calculated by the Ruppel method.

CONTROL OF BANKS GRASS MITE AND WESTERN CORN ROOTWORM ADULTS WITH AERIALLY APPLIED INSECTICIDES, CODY FARM, BURLINGTON, CO, 1998

Stan Pilcher, Dave Kennedy and Marion Seward, Golden Plains Area Cooperative Extension; Shawn Walter, Frank Peairs, Department of Bioagricultural Sciences and Pest Management.

CONTROL OF BANKS GRASS MITE AND WESTERN CORN ROOTWORM BEETLES WITH AERIALLY APPLIED INSECTICIDES, CODY FARM, BURLINGTON, CO, 1998: Applications of Capture 2E, 0.08 lb (AI)/acre and Capture 2E, 0.08 lb (AI)/acre + dimethoate 4E, 0.50 lb (AI)/acre were made on 24 July 1998. An AgCat Model C aircraft was used equipped with 36 CP nozzles (deflector set at 30°), calibrated to apply three gal/acre at an airspeed of 135 mph over an effective swath width of 65 ft. Conditions at the time of application were wind speed less than five mph, temperature 82°F and 40% relative humidity. Both Capture 2E plots were treated with Penncap M, 0.19 lb (AI)/acre, on 18 August 1998. A Weatherly aircraft was used equipped with 23 CP nozzles (deflector set at 30°), calibrated to apply two gal/acre at an airspeed of 125 mph over an effective swath width of 55 ft. Conditions at the time of application were wind speed less than five mph, temperature 80°F and 35% relative humidity. The untreated plot consisted of 86 rows on the SE side of the field. The Capture 2E plot was the 130 rows to the north of the untreated plot. The remainder of the field was treated with Capture 2E + dimethoate.

Banks grass mite infestations were evaluated on 21 July (precounts) and 4, 11 and 17 August 1998 by determining the number of mite-infested leaves on three groups of 10 plants in each plot. Western corn rootworm adults densities on three sets of 10 plants were evaluated on 4, 11 and 17 August 1998. Beetle counts were accomplished by counting the visible beetles present from a distance, then examining the ear tip counting the beetles present in the leaf axils, ear husk, etc. and then opening the ear tip and counting the remaining beetles.

Yields were measured by hand harvesting six 17.5 ft sections of row in the untreated and the Capture 2E plot. Harvested ears were shelled with an Amanco stationary thresher, and moisture and test weights were determined. Yields were converted to bu/acre adjusted to 15% moisture.

Data from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (a=0.05).

Pretreatment beetle counts averaged 4.0 beetles per plant with 4% gravid females. On 28 July 1998, 12-15% of the females were gravid. The Penncap M retreatment was made because western corn rootworm counts exceeded the economic threshold of 0.4 beetles per plant in the Capture + dimethoate plot. This was due to extended beetle emergence and immigration from the untreated area.

Both treatments significantly reduced the number of mite-infested and/or symptomatic leaves at each sample date compared to the untreated control. Western corn rootworm populations were significantly reduced compared to the untreated control at the first two sample dates. Yields in the Capture 2E plot were not significantly different from the untreated control.

Field History

Pest:	Banks grass mite, *Oligonychus protensis* (Banks) Western Corn Rootworm, *Diabrotica virgifera virgifera* LeConte
Cultivar:	Pioneer 34K 77
Planting Date:	21 April 1998
Plant Population:	32,000
Irrigation:	Sprinkler
Crop History:	Continuous corn 10 years
Herbicide:	Marksman, 2 pts/acre
Insecticide:	None prior to experiment
Fertilization:	210 N, 25 P, 0 K, 5 S, 0.5 Zn
Soil Type:	Clay Loam, OM 2.0%, pH 7.8
Location:	Kit Carson County, CO, NW ¼, Section 6, 7N 42W

Table 1. Control of Banks grass mite and western corn rootworm adults with aerially-applied insecticides, Cody Farm, Burlington, CO, 1998.

		CAPTURE 2E, 0.08[1]	CAPTURE 2E, 0.08 + DIMETHOATE, 0.50[1]	UNTREATED
MITE INFESTED LEAVES	4 AUGUST	4.4 ± 0.3 (0.0011)	4.2 ± 0.4 (0.0019)	7.0 ± 0.1
	11 AUGUST	3.5 ± 0.3 (< 0.0001)	3.8 ± 0.2 (< 0.0001)	8.5 ± 0.2
	17 AUGUST	4.8 ± 0.3 (< 0.0001)	4.0 ± 0.4 (< 0.0001)	11.6 ± 0.3
BEETLES PER PLANT	4 AUGUST	0.7 ± 0.1 (0.0022)	0.2 ± 0.1 (0.0015)	4.8 ± 0.6
	11 AUGUST	0.8 ± 0.1 (0.0013)	0.4 ± 0.0 (0.0008)	4.7 ± 0.5
	17 AUGUST	2.9 ± 0.3 (0.3926)	1.2 ± 0.2 (0.0643)	4.0 ± 1.1
YIELD (BU/ACRE @ 15% MOISTURE)		220.3 ± 5.5 (0.4731)	—	214.8 ± 4.8

[1]Number in parenthesis indicates probability of mean being similar to the untreated control, calculated with a two-tailed t-test with assumed equal variance (a=0.05).

CONTROL OF CORN SPIDER MITES AND WESTERN CORN ROOTWORM WITH AERIALLY APPLIED INSECTICIDES, LUCERNE, CO, 1998

Terri Randolph, Shawn Walter, Aaron Spriggs, Hayley Miller, Alison Clayshulte, Jeff Rudolph, Frank Peairs, Department of Bioagricultural Sciences and Pest Management.

CONTROL OF CORN SPIDER MITES AND WESTERN CORN ROOTWORM WITH AERIALLY APPLIED INSECTICIDES, LUCERNE, CO, 1998: Comite II, 1.69 lb (AI)/acre + dimethoate 4E, 0.50 lb (AI)/acre was applied on 11 July 1998. An AT400A aircraft was used equipped with 31 C-P brand nozzles with 0.078 orifice and calibrated to apply 2 gal/acre at 135 mph at 35 psi over an effective swath width of 65 ft. Comite II, 2.53 lb (AI)/acre and Capture 2E, 0.08 lb (AI)/acre were applied on 21 July 1998 in the same manner. Two corn fields separated by a wheat field were used for this experiment. Two Comite treatments and one untreated control were to the west of the wheat and the Capture treatment and a second untreated control were to the east of the wheat. All treatments were one swath width by the length of the field.

Treatments were evaluated on 10 July 1998 (precounts), 17 July, 3 August, 7 August, 14 August, 21 August and 28 August 1998. Mite infestations were evaluated by determining the number of mite infested leaves on 10 sets of 10 consecutive plants in the middle row of each treatment. The number of mites on the ear leaf were counted on one of the plants in each of the 10 sets of 10 consecutive plants on 28 August 1998. Western corn rootworm densities were evaluated on each sampling date by counting the adult beetles present on one plant of each of the 10 sets of 10 consecutive plants. Beetle counts were accomplished by counting the visible beetles present from a distance, then examining the ear tip counting the beetles present in the leaf axils, ear husk, etc. and then opening the ear tip and counting the remaining beetles.

Yield was measured on 1 October 1998 by hand-harvesting 17.5 ft of row in the adjacent row to the 10 locations in each plot from which pest data was recorded. Harvested ears were shelled. Moisture and test weight were determined. Yields were then converted to bu/ac at 15.5% moisture.

Data from treated plots was compared to the respective untreated control using a two-tailed t-test with assumed equal variance (a=0.05).

Mite infestation was moderate to high with greater numbers of mites present in the western field. The Comite + dimethoate treatment significantly reduced the number of infested leaves at each sample date and significantly reduced the number of mites on the ear leaf. The Comite treatment significantly reduced the number of infested leaves at all but the two week post treatment sampling but did not significantly reduce the number of mites on the ear leaf. The Capture treatment significantly reduced the number of infested leaves by two weeks post treatment and also significantly reduced the number of mites on the ear leaf.

Western corn rootworm beetle populations were low across the experiment. No treatment significantly controlled beetle populations compared to untreated control for all sample dates. The Comite II + dimethoate treatment significantly controlled western corn rootworm adults at three, four and five weeks post treatment compared to the untreated control. The Capture treatment significantly controlled the beetles compared with the untreated control by three weeks post treatment.

Treatment yields were all lower than the untreated control but since this was an unreplicated trial, the effect is probably not related to treatment.

Field History

Pest:	Banks grass mite, *Oligonychus pratensis* (Banks)
	Western corn rootworm, *Diabrotica virgifera virgifera* LeConte
Cultivar:	Pioneer 3751
Planting Date:	15 April 1998
Plant Population:	37,000
Irrigation:	Furrow
Crop History (West):	Wheat
Crop History (East):	Alfalfa
Herbicide:	Prowl, Banvel, Accent
Insecticide:	None prior to experiment
Fertilization:	200 N
Soil Type:	not available
Location:	CR 70 & CR 35, Weld County

Table 1. Control of corn spider mites and western corn rootworm with aerially applied insecticides, Lucern, CO, 1998.

		COMITE II[1]	COMITE II + DIMETHOATE[1]	UNTREATED CONTROL	CAPTURE[1]	UNTREATED CONTROL
MITE INFESTED LEAVES	PRECOUNT	5.1 ± 0.2 (0.0239)	4.6 ± 0.2 (0.4765)	4.4 ± 0.2	3.4 ± 0.2 (0.6732)	3.3 ± 0.1
	1 WEEK	6.9 ± 0.2 (0.0018)	1.6 ± 0.5 (< 0.0001)	5.8 ± 0.2	3.9 ± 0.2 (0.4293)	3.7 ± 0.1
	2 WEEKS	7.1 ± 0.2 (0.6893)	0.2 ± 0.1 (< 0.0001)	7.4 ± 0.7	0.4 ± 0.1 (< 0.0001)	4.1 ± 0.2
	3 WEEKS	8.7 ± 0.4 (0.0387)	0.0 ± 0.0 (< 0.0001)	10.2 ± 0.6	0.0 ± 0.0 (< 0.0001)	4.8 ± 0.3
	4 WEEKS	10.4 ± 0.1(< 0.0001)	0.0 ± 0.0 (< 0.0001)	13.2 ± 0.1	0.1 ± 0.0 (< 0.0001)	6.9 ± 0.2
	5 WEEKS	13.1 ± 0.5 (0.0072)	0.3 ± 0.1 (< 0.0001)	14.7 ± 0.1	0.2 ± 0.1 (< 0.0001)	9.4 ± 0.4
	6 WEEKS	13.0 ± 0.1 (0.0034)	1.2 ± 0.4 (< 0.0001)	13.6 ± 0.2	3.3 ± 0.3 (< 0.0001)	13.2 ± 0.2
MITES PER EAR LEAF		538.5 ± 205.5 (0.3765)	6.2 ± 2.9 (0.0049)	330.8 ± 101.2	1.3 ± 0.9 (0.0012)	83.3 ± 21.3
BEETLES PER PLANT	PRECOUNT	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
	1 WEEK	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
	2 WEEKS	0.4 ± 0.3 (0.1278)	0.7 ± 0.3 (0.3955)	1.1 ± 0.3	0.0 ± 0.0 (0.3306)	0.1 ± 0.1
	3 WEEKS	1.6 ± 0.3 (0.0739)	0.0 ± 0.0 (0.0049)	0.8 ± 0.3	0.1 ± 0.1(< 0.0001)	4.4 ± 0.8
	4 WEEKS	1.5 ± 0.3 (0.1892)	0.5 ± 0.3 (0.0019)	2.1 ± 0.3	0.0 ± 0.0 (< 0.0001)	1.3 ± 0.3
	5 WEEKS	2.1 ± 0.5 (0.4700)	0.1 ± 0.1 (< 0.0001)	2.6 ± 0.5	0.2 ± 0.1 (< 0.0001)	2.5 ± 0.2
	6 WEEKS	0.2 ± 0.1 (0.6958)	0.2 ± 0.1 (0.6958)	0.3 ± 0.2	0.0 ± 0.0 (0.0248)	0.4 ± 0.2
YIELD (BU/ACRE @ 15.5%)		195.43 ± 3.60 (0.1760)	192.85 ± 2.68 (0.0254)	204.45 ± 2.30	187.68 ± 2.62 (0.0660)	195.06 ± 2.71

[1]Probability of being similar to the untreated control, calculated with a two-tailed t-test with assumed equal variance (a=0.05).

CONTROL OF SUNFLOWER STEM WEEVIL WITH AT-PLANT AND CULTIVATION TREATMENTS, CENTRAL GREAT PLAINS RESEARCH STATION, AKRON, CO, 1998

Stan Pilcher, Ron Meyer, David Kennedy, Marion Seward, Golden Plains Area Cooperative Extension; Mike Koch, Central Great Plains Research Station; Shawn Walter, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF SUNFLOWER STEM WEEVIL WITH AT-PLANT AND CULTIVATION TREATMENTS, CENTRAL GREAT PLAINS RESEARCH STATION, AKRON, CO, 1998: Planting time treatments were applied on 18 May 1998 with a John Deere Maxi-Merge planter equipped with a micro-injection unit. Furadan 4F at 1.4 oz per 1000 ft of drill row was diluted 1:1 with water and injected in-furrow above the seed and ahead of the press wheel. Cultivation treatments were applied on 6 July 1998 at the V6 to V10 plant growth stage with a CO_2 powered sprayer with an over-whorl nozzle (11004VS-TJ) positioned 12 inches over the whorl mounted on a Liliston cultivator. The sprayer was calibrated to deliver 10 ml/sec. Plots were 4 rows by 50 ft and were arranged in four replicates of a randomized complete block design.

Adult weevil counts prior to the cultivation applications averaged 1 weevil per 3 plants. Treatments were evaluated on 11 September 1998 by splitting the stalks of three plants per plot and recording the number of sunflower stem weevil larvae in the lowest 18 inches of each stalk. Percent lodging was determined on 20 October 1998 by counting the total number of plants and the number of lodged plants in the center two rows of each plot. Larval counts and lodging were subjected to analysis of variance and mean separation by the Student-Neuman-Keul method (a=0.05).

Yields were determined by harvesting 17.5 ft of row from the center of the four untreated plots and the four plots treated with Furadan 4F at planting. Harvested grain was weighed and moisture and test weight were determined. Yields were converted to lb/acre.

This 1998 sunflower crop followed a 1996-97 wheat crop. Germination and seedling emergence was excellent due to stored soil moisture in the 1 to 6 inch depth. Stored moisture below this depth was low (1-12 inches = 45%; 1-2 feet = 15%; and 2-6 feet # 15%). During the growing season a total of 7.60 inches of moisture was recorded (May - 0.96 inches, June - 0.36 inches, July - 3.84 inches, & August - 2.44 inches). The 17,000 plant population increased drought stress resulting in reduced head diameter (mean = 3.75 inches), small stalk diameter (mean = 0.55 inches) and low yields.

All treatments reduced sunflower stem weevil density. Yields were not significantly affected (two-tailed t-test, assumed equal variance, t=1.2149, df=14, $p(t>t_{.05})=0.2445$) by treatment in this experiment. The average treated yield was 767 ± 69 lb/acre while the average for the untreated plots was 651 ± 66 lb/acre. The economic injury level for this pest based on larvae per plant is not clear, but is probably affected by stalk diameter and the Phoma Black Stem rot sometimes associated with infestations. Phoma Black Stem was not a significant factor in this study. Although stalk diameter was reduced by moisture stress, weevil densities were also low so treatment did not reduce lodging. Harvest and lodging evaluations were made prior to any severe weather that might have interacted with stem weevil damage to cause significant lodging and harvest losses.

Field History

Pest:	Sunflower stem weevil, *Cylindrocopturus adspersus* (LeConte)
Cultivar:	Cargill 187
Planting date:	18 May 1998
Plant Population:	17,000
Irrigation:	none
Crop History:	Wheat 1996-97
Herbicide:	Sonolan 10G 0.66 lb./ac 6 May and 0.33 lb./ac 14 May 1998
Insecticide:	None prior to experiment
Fertilizer:	40 N
Soil Type:	Weld Silt Loam
Location:	USDA Central Great Plains Research Station, Akron, CO.

Table 1. Control of sunflower stem weevil with planting and cultivation timed treatments, Central Great Plains Research Station, Akron, CO, 1998.

PRODUCT, LB(AI/ACRE)	TIMING	SSW LARVAE [1]	% CONTROL	% LODGING[1]
FURADAN 4F, 0.50	CULTIVATION	0.0 ± 0.0 C	100	2.0
FURADAN 4F, 1.00	CULTIVATION	0.0 ± 0.0 C	100	2.4
FURADAN 4F, 0.75	AT-PLANT	0.2 ± 0.2 C	96	1.9
WARRIOR 1E, 0.03	CULTIVATION	0.9 ± 0.5 BC	79	7.4
TD-2344-02 8E, 0.025	CULTIVATION	1.7 ± 0.6 BC	61	9.9
WARRIOR 1E, 0.02	CULTIVATION	1.8 ± 0.7 BC	60	7.7
TD-2344-02 8E, 0.04	CULTIVATION	2.6 ± 0.7 B	40	6.8
UNTREATED	—	4.4 ± 0.7 A	0	10.0
F Value		8.59	—	1.93
p > F		< 0.0001	—	0.1112

[1]Sunflower stem weevil larvae per three plants. Means in the same column followed by the same letter(s) are not statistically different, SNK (a=0.05).

CONTROL OF SUNFLOWER INSECTS WITH AERIALLY-APPLIED INSECTICIDES, CENTRAL GREAT PLAINS RESEARCH STATION, AKRON, CO, 1998

Stan Pilcher, Dave Kennedy, Marion Seward, Golden Plains Area Cooperative Extension; Mike Koch, Central Great Plains Research Station; Shawn Walter, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF SUNFLOWER INSECTS WITH AERIALLY-APPLIED INSECTICIDES, CENTRAL GREAT PLAINS RESEARCH STATION, AKRON, CO, 1998: Treatments were applied on 2 August 1998 with a Weatherly 802B aircraft equipped with 32 CP nozzles (deflectors set at 125E) on a 42 ft boom. The aircraft was calibrated to apply 2 gal/acre at 20 psi at an air speed of 125 mph over an effective swath width of 60 ft. Conditions at the time of treatment were temperature 84EF, relative humidity 52% and wind speed less than 5 mph. Plots were three swath widths through the 4.2 acre field. The treatments were applied when 5 to 10% of the plants were in the R-5.1 plant growth stage.

On 19 August 1998, 12 heads in the R-6 plant growth stage (wilted ray petals) were selected per plot and covered with Delnet bags, each containing one cup of soil. Bagged heads were collected at the R-8 growth stage (onset of physiological maturity). Treatments were evaluated on 27 October 1998 by counting banded sunflower moth larvae in the heads and seed weevil larvae in the soil. Data from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (a=0.05).

Red seed weevil adults averaged 4.0 per head and gray seed weevil adults averaged 0.5 per head prior to treatment. Sunflower moth and banded sunflower moth were monitored with pheromone jug traps at the treatment sight. Banded sunflower moths averaged 7 moths per trap per night at the time of treatment. No sunflower moths were detected through the monitoring period.

All treatments controlled seed weevils (Table 1). Both rates of TD2344-02 controlled banded sunflower moth but both the trap catches and the larval densities were below economically significant levels. No phytotoxicity was observed with any treatment.

Field History

Pests:	Banded sunflower moth, *Cochylis hospes* Walsingham Seed weevils, *Smicronyx* spp.
Cultivar:	Cargill 187
Planting Date:	20 May 1998
Plant Population:	17,000
Crop History:	Wheat 1996-97
Herbicide:	Sonolan 10G 0.66 lb (AI)/acre 6 May and 0.33 lb (AI)/acre 14 May 1998
Insecticide:	None prior to experiment
Fertilization:	40 N
Soil Type:	Weld Silt Loam
Location:	USDA Central Great Plains Research Station, Akron, CO.

Table 1. Aerial treatments for control of banded sunflower moth (BSM) and seed weevils, Central Great Plains Research Station, Akron, CO, 1998.

PRODUCT, LB(AI)/ACRE	LARVAE PER HEAD		% CONTROL SEED WEEVILS
	BSM [1]	SEED WEEVILS [1]	
TD 2344-02 0.8E, 0.025	0.0 ± 0.0 (0.0063)	0.3 ± 0.1 (0.0009)	99
WARRIOR 1E, 0.03	0.3 ± 0.2 (0.2191)	0.7 ± 0.6 (0.0011)	97
TD 2344-02 0.8E, 0.04	0.1 ± 0.1 (0.0265)	0.8 ± 0.4 (0.0011)	97
LORSBAN 4E, 0.75	0.2 ± 0.1(0.0755)	1.5 ± 0.7 (0.0015)	94
UNTREATED CONTROL	0.6 ± 0.2	24.4 ± 6.3	—

[1]Number in parenthesis is the probability of being similar to the untreated control, calculated with a two-tailed t-test with assumed equal variance (a=0.05).

THE GOLDEN PLAINS PEST SURVEY PROGRAM

The Golden Plains Pest Survey Program monitors economically significant insects in the Golden Plains Area through field scouting and the use of light and pheromone traps. It is sponsored solely through donations by area growers and other members of the agriculture industry. Scouting-based integrated pest management information is provided weekly to subscribers through newsletters, news releases to 24 area newspapers, radio broadcasts (The What's Bugging You Report) on 5 local radio stations, the Farm Dayta/DTN Network and the World Wide Web. This years Golden Plains Pest Survey Program was coordinated by M. C. Seward, a 1996 graduate of Colorado State University, and Dave Kennedy, graduate student attending Colorado State University.

We would like to thank the following individuals for their support and dedication to making this year's Golden Plains Pest Survey a success:

1998 Light Trap Operators:

Bonny Dam	Bill Cody Jr. and Family
Burlington	Stratton Equity COOP
Clarkville	Dennis Salvador
Eckley	Merle and Hazel Gardner
Holyoke	Scott Korte

1998 Light Trap Operators:

Kirk	Gene Nelson
Wauneta	Clark Lenz
Wray	Gleason Dryden
Yuma	Irrigated Research Farm

1998 Pest Survey Committee:

Allan Brax	Mike Fecht
Bill Brown	Merlin Van Deraa
Frank Peairs	Mike Ferrari
John Person	Bill Cody
Dave Green	Ron Meyer
Gene Kleve	Randy Haarberg
Stan Pilcher	John Kreidler
Jack Rhodes	Todd Frank

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Eckley: Tom Kerbs (Kerbs Land & Cattle), Max Schafer, Kathy Wenger, CCA, Merle & Hazel Gardner (Spittoon Ranch).

Elsie, NE: Don Langmacher, Dick Leonard.

Enders, NE: Terry Bilka.

Flagler:	Randy & Linda Loutzenhiser (RLF Partnership), Dallas Saffer (Flagler Aerial Spraying Inc), E. Leroy Loutzenhiser (LKF Partnership), Rex Loutzenhiser.
Fleming:	Jim Atkin (Atkin Seeds).
Fort Collins:	Jim Ed Beach, CCA (Rhone Poulenc), Larry Schild (American Cyanamid), Richard Kelly Darland.
Fort Morgan:	Tim Carpenter (Centennial Ag Supply).
Gering, NE:	Joe Ortner.
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Grand Island, NE:	DEKALB Genetics Corp.
Grand Junction:	Grand Valley Hybrids, Inc
Grant, NE:	Mark McGreer, Larry Appel (Appel Crop Consulting, Inc,).
Greeley:	Tom Farris (Pueblo Chemical & Supply Co.), Bob Leisy (Asgrow), James E, Anderson (Bayer, Inc), Calvin Heimbauch, Bob Zellmer (Colorado Farm Network), Bill Curran, Chad Fabrizius (American Cyanamid).
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Haxtun:	Dennis Eckman, Dave Green (Servi-Tech), Garretson Inc., Larry McConnell (Pioneer Seeds), Larry Anderson (Zion Farms), Ken Kurtzer (Kurtzer Grain & Landscaping), Jared Anderson (Servi-Tech), Dick Fryrear (Triumph Seed).
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Idalia:	Larry Allen (Allen Grain).
Imperial, NE:	Rod Johnson (R-Nette Inc).
Joes:	Elden Hill, Randy Haarberg (Haarberg Consulting, Inc.), Kenneth Schneider, Richard Schneider (Schneider Farms Inc,).
Julesburg:	Steve Gerk, Paul Hahlweg, Bruce Holcombe.
Kirk:	Darrell Idler (Idler Brothers), James Idler (Idler Brothers), Edsel Collette, Eugene Nelson (Frank & Nelson), Ron Richards, Ervin Frank (Frank Farms), Todd Frank (Frank & Nelson), Kent Ficken.
Lamar, NE:	Kent Miller (Keen-Nan Farms).
Lincoln, NE:	Curt Clausen (Pioneer Hi-Bred International Inc.).
Lodgepole, NE:	Mike Behrends.
Longmont:	Lyle Fagala (Zeneca Ag Products), Paul Joe Ogg (American Cyanamid CO).
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Monument:	John T. Doyle (Rhone Poulenc)
North Platte, NE:	Mike Sughroue (American Cyanamid).
Ogallala, NE:	David DeVries (Platte Valley Crop Consulting), Allan Brax, Guy Jones, Clint Fuchs (Golden Harvest).
Otis:	Ken Melendy, Russ Groshans, Richard Lewton (Lewton Farms), Harlan & Donita Schaffert.
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Wray:	Lance Russell (Asgrow), Dick Yearous (Simplot Soilbuilders), KRDZ, Mike Bowman (Great Plains Co-op), Jim Soehner, Dennis Atwell, Stan & Carol Shafer, Dwight Rockwell, Alan Welp (Welp Farms), Marc Cartwright (Servi-Tech), Richard Byers (Great Plains Coop), Jim Bowman, Dave Wilson (Stalk, Inc), Howard Peaker (Wray State Bank), Glenn & Vera Rockwell (S. Glenn Rockwell, Inc.), Curt or George Fix (Co. Abstract), Yuma County Commissioners, John Kreidler (Ag Aviation, Inc.), Robert L. Sitzman (Slash Diamond Farms, LLC), Daryl Monasmith, Larry Gardner (Covenant Farms).
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We would like to extend a special thanks to this year's major contributors: Pioneer Hi-Bred International, Elf-Atochem Inc., FMC Corporation, American Cyanamid Company, and Asgrow.

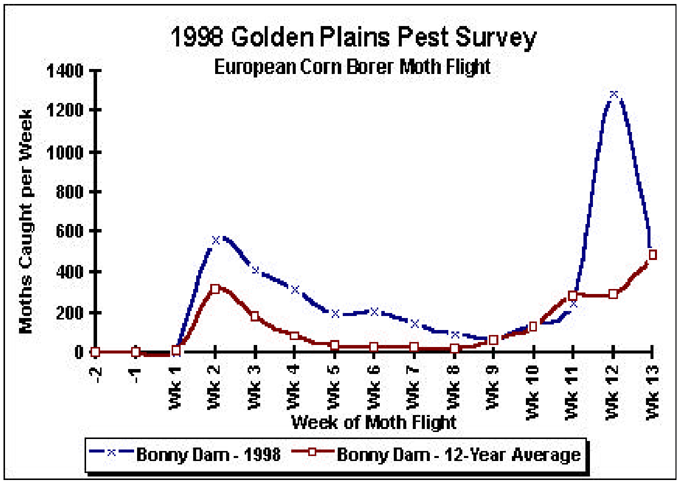
SUMMARY OF 1998 SUCTION AND LIGHT TRAP CATCHES

1998 European Corn Borer Moth Flights as Compared to Previous Years' Averages and 1998 Western Bean Cutworm Moth Flights:

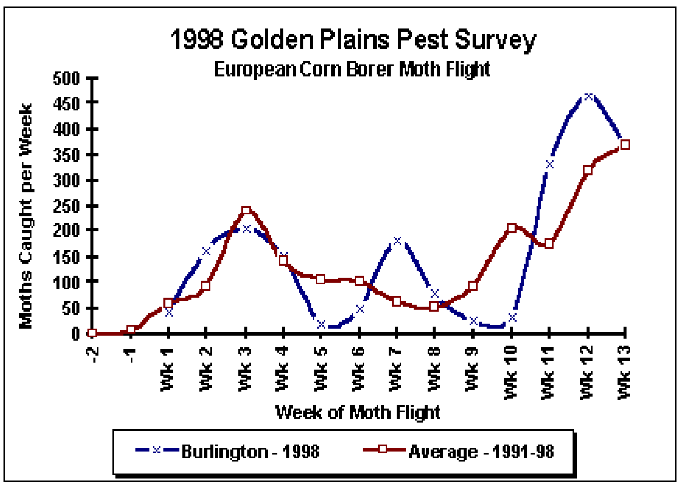
The following graphs compare the 1998 European corn borer moth flight with the average moth flight by geographic location. Geographic location is defined as a 10 square mile area. The number of years that contributed to the average ranges between 2 and 12. This historic information depicts the significance of a singular year. It describes locations where first and second generation are clearly defined with minor moth flights in between the major flights. Also shown are the locations where moth flights continued between the major flights with some flights extending late after the peak on second generation. Where continued or extended moth flights occur insecticidal control attempts often result in lower than normal expected control.

Clarkville, Burlington, and Bonny Dam had higher second generation European corn borer moth flights as compared to their average this year. Kirk and Burlington also had a continuous or mid flight between major flights. Yuma was below average on both flights. Eckley, Wray and Wauneta had low first generation moth flights with average second generation flights.

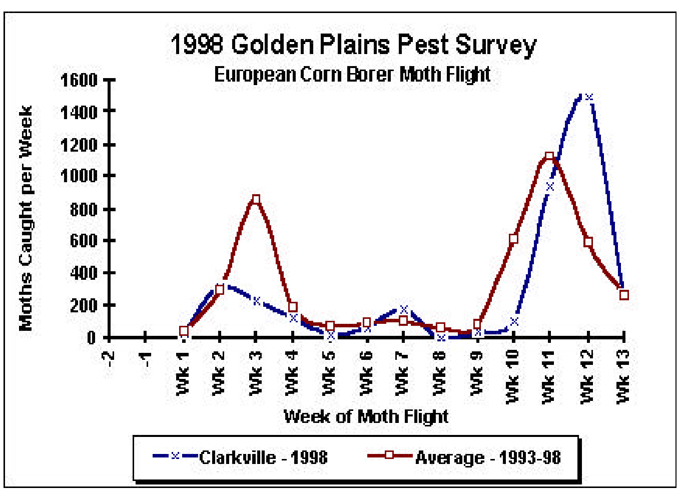
Western bean cutworm was relatively low at all locations.



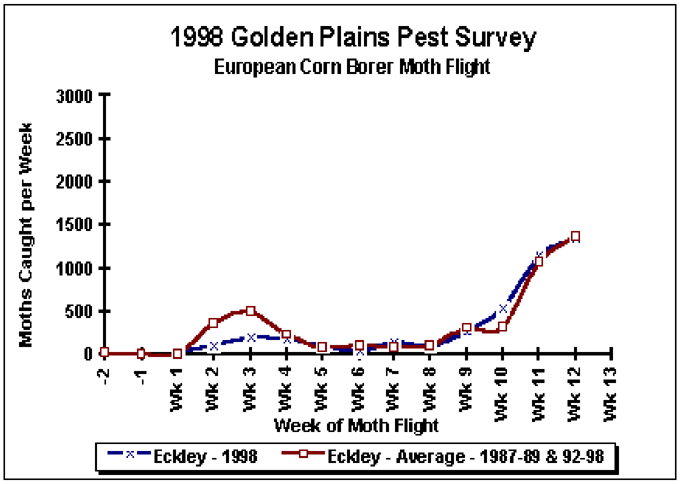
1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
1400
1200
1000
800
600
400
200
0
-2
-1
Wk 1
Wk 2
Wk 3
Wk 4
Wk 5
Wk 6
Wk 7
Wk 8
Wk 9
Wk 10
Wk 11
Wk 12
Wk 13
Week of Moth Flight
Bonny Dam - 1998
Bonny Dam - 12-Year Average

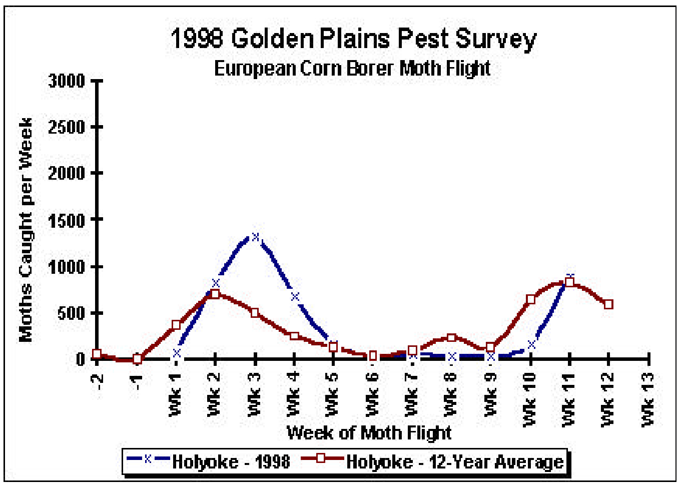


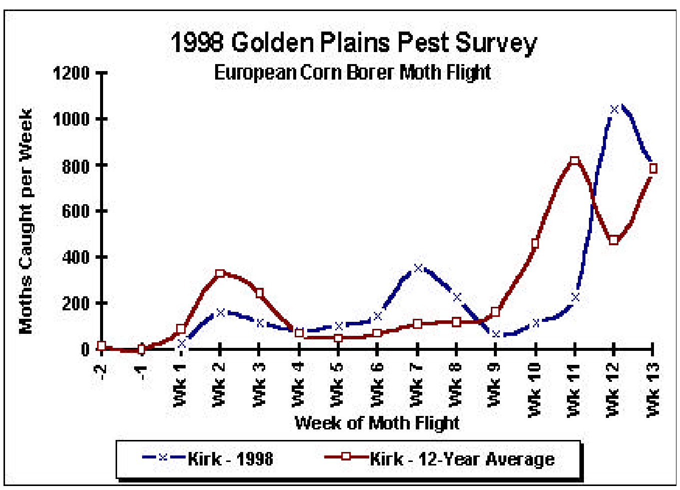
1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
500
450
400
350
300
250
200
150
100
50
0
-2
-1
Wk 1
Wk 2
Wk 3
Wk 4
Wk 5
Wk 6
Wk 7
Wk 8
Wk 9
Wk 10
Wk 11
Wk 12
Wk 13
Week of Moth Flight
Burlington - 1998
Average - 1991-98

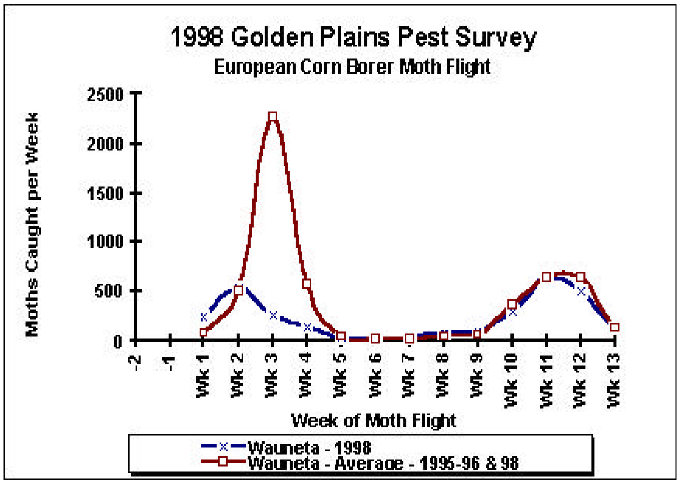


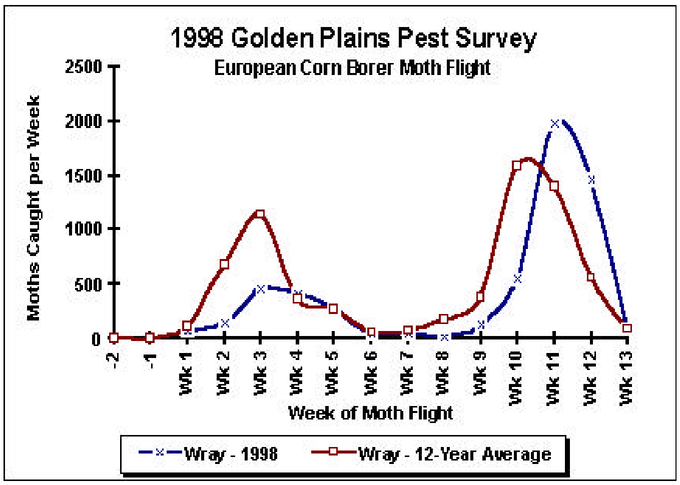
1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
1600
1400
1200
1000
800
600
400
200
0
-2
-1
Wk 1
Wk 2
Wk 3
Wk 4
Wk 5
Wk 6
Wk 7
Wk 8
Wk 9
Wk 10
Wk 11
Wk 12
Wk 13
Week of Moth Flight
Clarkville - 1998
Average - 1993-98

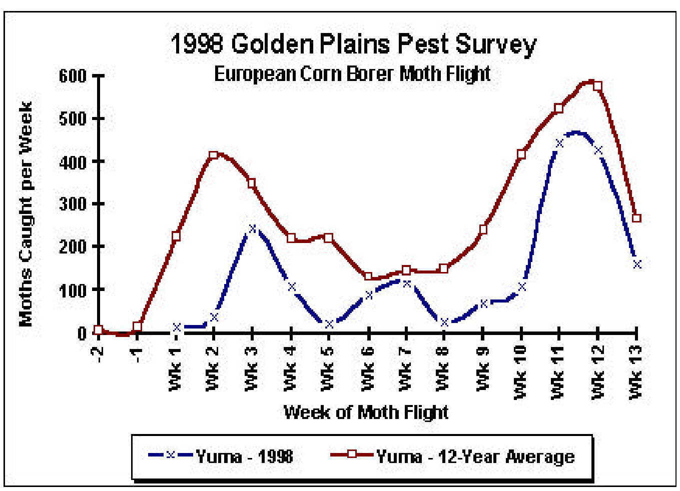

1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
Week of Moth Flight
Eckley - 1998
Eckley - Average - 1987-89 & 92-98

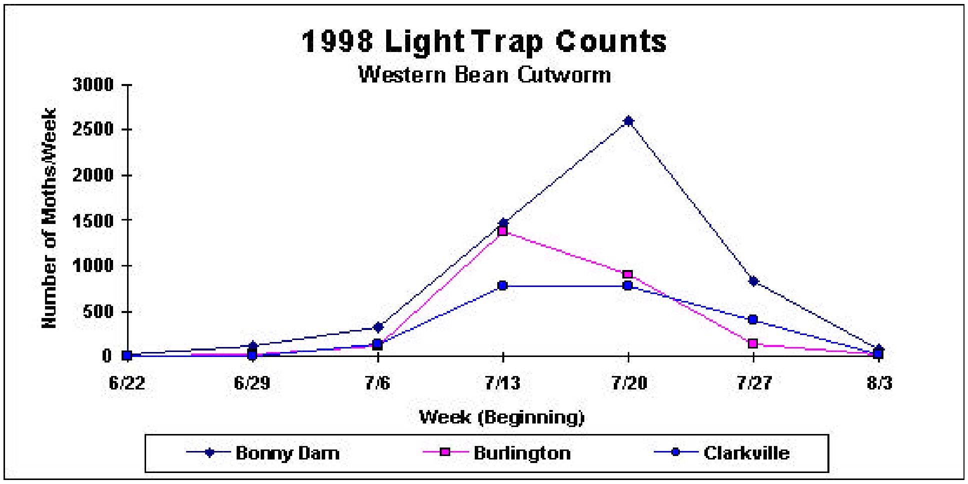

1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
Week of Moth Flight
Holyoke - 1998
Holyoke - 12-Year Average

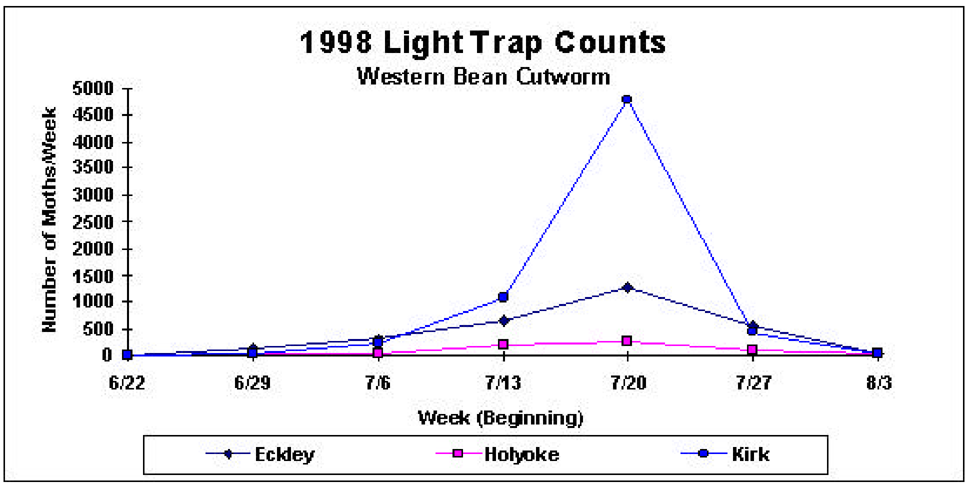

1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
Week of Moth Flight
Kirk - 1998
Kirk - 12-Year Average


1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
2500
2000
1500
1000
500
0
-2
-1
Wk 1
Wk 2
Wk 3
Wk 4
Wk 5
Wk 6
Wk 7
Wk 8
Wk 9
Wk 10
Wk 11
Wk 12
Wk 13
Week of Moth Flight
Wauneta - 1998
Wauneta - Average - 1995-96 & 98


1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
2500
2000
1500
1000
500
0
-2
-1
Wk 1
Wk 2
Wk 3
Wk 4
Wk 5
Wk 6
Wk 7
Wk 8
Wk 9
Wk 10
Wk 11
Wk 12
Wk 13
Week of Moth Flight
Wray - 1998
Wray - 12-Year Average


1998 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
600
500
400
300
200
100
0
-2
-1
Wk 1
Wk 2
Wk 3
Wk 4
Wk 5
Wk 6
Wk 7
Wk 8
Wk 9
Wk 10
Wk 11
Wk 12
Wk 13
Week of Moth Flight
Yuma - 1998
Yuma - 12-Year Average


1998 Light Trap Counts
Western Bean Cutworm
Number of Moths/Week
3000
2500
2000
1500
1000
500
0
6/22
6/29
7/6
7/13
7/20
7/27
8/3
Week (Beginning)
Bonny Dam
Burlington
Clarkville


1998 Light Trap Counts
Western Bean Cutworm
Number of Moths/Week
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
6/22
6/29
7/6
7/13
7/20
7/27
8/3
Week (Beginning)
Eckley
Holyoke
Kirk

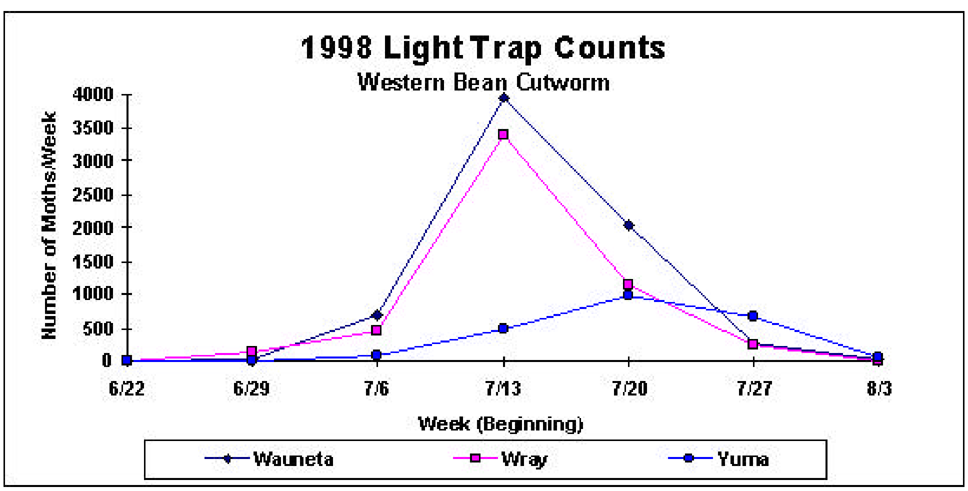

1998 Light Trap Counts
Western Bean Cutworm
Number of Moths/Week
4000
3500
3000
2500
2000
1500
1000
500
0
6/22
6/29
7/6
7/13
7/20
7/27
8/3
Week (Beginning)
Wauneta
Wray
Yuma

Table 1. Russian wheat aphid suction trap results at four Colorado locations, 1987-1998.

	AKRON	ARDEC[1]	FRUITA	WALSH
1987	—	1832	—	392
1988	172	92	2132	4636
1989	177	102	2497	5003
1990	1234	1353	2318	1275
1991	79	1679	1054	883
1992	186	1685	1032	789
1993	7	2	336	374
1994	496	867	327	3216
1995	73	322	224	361
1996	66	502	1064	---
1997	301	216	648	2501
1998	36	550	1330	31

[1]Trap moved to ARDEC (Agricultural Research, Development and Education Center, Colorado State University, Fort Collins, CO) from Briggsdale in 1990.

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 1998.

Table 1. Performance of planting-time insecticides against western corn rootworm, 1987-1998, in northern Colorado

INSECTICIDE	IOWA 1-6 ROOT RATING*
AZTEC 2.1G	2.6 (19)
COUNTER 15G	2.6 (25)
COUNTER 20CR	2.5 (31)
COUNTER 20G	2.6 (4)
DYFONATE 20G	2.8 (12)
FORCE 1.5G (8 OZ) or 3G (4 OZ)	2.7 (22)
FORTRESS 5G	2.7 (13)
LORSBAN 15G	3.0 (16)
THIMET 20G	3.4 (15)
UNTREATED CONTROL	4.2 (22)

*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 2. Performance of cultivation insecticide treatments against western corn rootworm, 1987-1998, in northern Colorado.

INSECTICIDE	IOWA 1-6 ROOT RATING*
COUNTER 15G	2.7 (14)
DYFONATE 20G	3.1 (9)
FORCE 1.5G or 3G	3.1 (6)
FURADAN 4F, 2.4 OZ, BANDED OVER WHORL	3.1 (11)
LORSBAN 15G	3.2 (11)
THIMET 20G	2.8 (14)
UNTREATED CONTROL	4.4 (18)

*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 3. Insecticide performance against first generation European corn borer, 1982-1998, in northeast Colorado.

MATERIAL	LB/ACRE	METHOD*	% CONTROL**
DIPEL 10G	10.00	A	66 (4)
DIPEL 10G	10.00	C	84 (2)
DIPEL ES	1 QT + OIL	I	91 (4)
LORSBAN 15G	1.00 (AI)	A	81 (4)

MATERIAL	LB/ACRE	METHOD*	% CONTROL**
LORSBAN 15G	1.00 (AI)	C	80 (6)
LORSBAN 4E	1.0 (AI)	I	89 (8)
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	89 (3)

*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.
**Numbers in parenthesis indicate that percent control is the average of that many trials.

Table 4. Insecticide performance against western bean cutworm, 1982-1998, in northeast Colorado.

MATERIAL	LB (AI)/ACRE	METHOD*	% CONTROL**
AMBUSH 2E	0.05	A	99 (2)
AMBUSH 2E	0.05	I	99 (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)

*A = Aerial, I = Center Pivot Injection
**Numbers in parenthesis indicate that percent control is average of that many trials.

Table 5. Insecticide performance against second generation European corn borer, 1982-1998, in northeast Colorado.

MATERIAL	LB (AI)/ACRE	METHOD*	% CONTROL**
DIPEL ES	1 QT PRODUCT	I	56 (16)
CAPTURE 2E	0.08	A	85 (8)
CAPTURE 2E	0.08	I	85 (13)
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)

MATERIAL	LB (AI)/ACRE	METHOD*	% CONTROL**
POUNCE 3.2E	0.15	I	74 (10)
WARRIOR 1E	0.03	A	83 (3)
WARRIOR 1E (T)	0.03	I	77 (3)

*A = Aerial, I = Center Pivot Injection
**Numbers in parenthesis indicate how many trials are averaged.

Table 6. Performance of hand-applied insecticides against alfalfa weevil larvae, 1984-1998, in northern Colorado.

PRODUCT	RATE	% CONTROL AT 2 WK*
BAYTHROID 2E	0.025	97 (5)
FURADAN 4F	0.25	91 (9)
FURADAN 4F	0.50	94 (16)
LORSBAN 4E	0.75	94 (12)
LORSBAN 4E	1.00	96 (6)
LORSBAN 4E	0.50	83 (10)
PENNCAP M	0.75	88 (9)
PERMETHRIN **	0.10	67 (7)
PERMETHRIN **	0.20	80 (4)
WARRIOR 1E	0.02	98 (9)

*Number in parenthesis indicates number of years included in average.
**Includes both Ambush 2E and Pounce 3.2E.

Table 7. Control of Russian wheat aphid with hand-applied insecticides in winter wheat, 1986-1998*.

PRODUCT	LB (AI)/ACRE	TESTS WITH > 90% CONTROL	TOTAL TESTS	% TESTS WITH > 90% CONTROL
LORSBAN 4E	0.50	19	35	54
DI-SYSTON 8E	0.75	12	37	32
DIMETHOATE 4E	0.375	6	29	21
DI-SYSTON 8E	0.50	2	10	20
PENNCAP M	0.75	3	17	18
LORSBAN 4E	0.25	3	16	19
THIODAN 3E	0.50	1	4	25
WARRIOR 1E	0.03	0	9	0

*Includes data from several states.

Table 8. Control of spider mites in artificially-infested corn with hand-applied insecticides, ARDEC, 1993-1998.

PRODUCT	**LB (AI)/ACRE**	**% REDUCTION IN TOTAL MITE DAYS***
CAPTURE 2E	0.08	54 (6)
CAPTURE 2E + DIMETHOATE 4E	0.08 + 0.50	66 (6)
CAPTURE 2E + FURADAN 4F	0.08 + 0.50	66 (4)
COMITE II	1.64	26 (6)
COMITE II + DIMETHOATE 4E	1.64 + 0.50	58 (3)
DIMETHOATE 4E	0.50	56 (6)
FURADAN 4F	1.00	49 (6)

*Number in parenthesis indicates number of tests represented in average.

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	Eldon & Gleason Dryden	Wray
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	Richard Wacker	Yuma
SUNFLOWER	USDA Central Great Plains Research Station	Akron
WHEAT	Rick Lewton	Akron
	Dallas Oestman	Wray

TEST PLOT APPLICATORS

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Farm Air Service, Nicholas Scott	Burlington
Ag Aviation, John Kreidler	Wray
Yuma Ag Service, Jerry McPherson	Yuma
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C and C Aerial Spray, Doug Campbell	Greeley

EQUIPMENT MANUFACTURERS

Agri-Inject, Gary Newton	Yuma

PRODUCT INDEX