LTB00-1

1999 Colorado Field Crop Insect Management Research and Demonstration Trials

TABLE OF CONTENTS

CONTROL OF RUSSIAN WHEAT APHID IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1999

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CONTROL OF RUSSIAN WHEAT APHID IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1999: Treatments were applied on 7 April 1999 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 clear with winds from the north at approximately 5 mph and temperature at 50EF at the time of treatment. Plots were 4 rows 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 25 February 1999.

Treatments were evaluated by collecting 10 symptomatic tillers along the middle rows of each plot one 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 46 ± 15 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 (á=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 (á=0.05) with original means presented in the tables.

Aphid pressure was not as severe as in past artificially-infested winter wheat experiments. All treatments had fewer aphids than the untreated control at 1, 2 and 3 weeks after treatment. All treatments had fewer aphid days than the untreated control over the course of the experiment. There were no differences among treatments in terms of reduced aphid days. Lorsban 4E-SG, 0.5, Di-Syston 8E, 0.75, Warrior 1E, 0.03, Penncap M 2FM, 0.50 + Lorsban 4E, 0.38, Lorsban 4E-SG, 0.25 and Penncap M 2FM, 0.38 + Lorsban 4E, 0.38 treatments reduced total aphid days over three weeks 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:	10 September 1998
Irrigation:	Post planting, Linear move sprinkler with drop nozzles
Crop History:	Pinto beans in 1998
Herbicide:	None
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Clay loam, OM 1.7%, pH 7.8
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (northeast side of Block 1070)

Table 1. Control of Russian wheat aphid in winter wheat, ARDEC, Fort Collins, CO, 1999.

	APHIDS PER 10 TILLERS ± SEM[1]				
PRODUCT, LB (AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**	**TOTAL APHID DAYS**	**% REDUCTION[2]**
LORSBAN 4E-SG, 0.5	2.7 ± 1.7 B	1.3 ± 0.6 B	4.2 ± 2.4 C	33.3 ± 14.6 B	97
CAPTURE 2E, 0.03	15.2 ± 4.6 B	36.0 ± 14.6 B	5.0 ± 2.3 C	322.6 ± 114.7 B	69
DI-SYSTON 8E, 0.75	3.3 ± 1.0 B	1.7 ± 0.6 B	5.2 ± 2.3 C	41.4 ± 12.5 B	96
WARRIOR 1E, 0.03	4.3 ± 1.1 B	9.0 ± 2.5 B	4.8 ± 1.8 C	95.1 ± 21.8 B	91
PENNCAP M 2FM, 0.50+LORSBAN 4E, 0.38	3.5 ± 1.1 B	3.8 ± 2.9 B	5.2 ± 2.2 C	57.2 ± 25.6 B	95
LORSBAN 4E-SG, 0.25	4.0 ± 1.7 B	5.7 ± 3.4 B	8.0 ± 2.8 C	81.7 ± 33.0 B	92
PENNCAP M 2FM, 0.38+LORSBAN 4E, 0.38	4.5 ± 2.1 B	6.2 ± 4.3 B	9.3 ± 5.8 C	91.6 ± 35.1 B	91
PENNCAP M 2FM, 0.50+LORSBAN 4E, 0.25	7.5 ± 6.0 B	8.0 ± 3.1 B	14.8 ± 5.6 BC	134.2 ± 48.2 B	87
PENNCAP M 2FM, 0.50+DIMETHOATE 4E, 0.38	16.3 ± 11.2 B	27.0 ± 21.3 B	24.8 ± 16.4 BC	333.1 ± 243.1 B	68
DIMETHOATE 4E, 0.38	15.0 ± 6.9 B	35.2 ± 12.4 B	35.5 ± 19.1 BC	422.9 ± 156.0 B	60
PENNCAP M 2FM, 0.75	11.0 ± 2.6 B	10.8 ± 3.4 B	44.2 ± 11.7 B	268.9 ± 42.9 B	75
UNTREATED	47.3 ± 10.9 A	74.5 ± 14.5 A	105.2 ± 14.5 A	1055.3 ± 164.6 A	—
F Value	4.86	4.04	7.32	5.41	
p > F	< 0.0001	< 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 (á=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, 1999

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

CONTROL OF RUSSIAN WHEAT APHID IN SPRING BARLEY WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1999: Treatments were applied on 27 May 1999 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 overcast with winds from the north at 3-5 mph and temperature was 55EF at the time of treatment. Plots were 2 beds by 25.0 ft and were arranged in four replicates of a randomized, complete block design. Crop stage at the application date was at boot stage (Zadoks 45-49). The crop had been infested at the 2 leaf stage (Zadoks 12) with greenhouse-reared aphids on 19 April 1999. Due to high winds, heavy snow and cold weather, crop was reinfested at the tillering stage (Zadoks 23-25) on 6 May 1999.

Treatments were evaluated by collecting 20 symptomatic tillers per plot 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 293 ± 38 Russian wheat aphids per 20 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 (á=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 (á=0.05) with original means presented in the tables.

Aphid pressure was as severe as observed in past artificially-infested spring barley experiments. Barley stands were poor due to early season wind damage and severe weed pressure. All treatments had fewer aphids than the untreated control at each sampling date. All treatments had fewer aphid days than the untreated control. All treatments except Penncap M 2FM, 0.75 reduced total aphid days by more than 90% after 3 weeks, the level of performance observed by the more effective treatments in past winter wheat experiments. Treatment yields were similar to the untreated control. No phytotoxicity was observed with any treatment.

Field History

Pest:	Russian wheat aphid, *Diuraphis noxia* (Mordvilko)
Cultivar:	Moravian 37
Planting Date:	9 March 1999
Irrigation:	Furrow
Crop History:	Pinto beans in 1998
Herbicide:	Banvel (3 fl oz/acre) on 25 March 1999; Harmony Extra (0.3 oz/acre) on 12 May 1999; Roundup (10%) on 15 July 1999 as a harvest aid
Insecticide:	None prior to experiment
Fertilization:	None
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (east side of Block 600)

Table 1. Control of Russian wheat aphid in spring barley, ARDEC, Fort Collins, CO, 1999.

PRODUCT, LB(AI)/ACRE	APHIDS PER 20 TILLERS ± SEM[1] 1 WEEK	2 WEEKS	3 WEEKS	TOTAL APHID DAYS ± SEM[1]	% REDUCTION[2]	YIELD[3]
PENNCAP M 2FM, 0.38+DIMETHOATE 4E, 0.38	35.5 ± 12.9 B	191.5 ± 67.5 BC	84.3 ± 34.1 C	1759.6 ± 608.4 B	93	47 A
WARRIOR 1E, 0.02	31.4 ± 10.2 B	101.6 ± 23.3 C	106.3 ± 30.1 BC	1193.1 ± 247.4 B	95	49 A
WARRIOR 1E, 0.03	9.0 ± 4.7 B	96.0 ± 46.6 C	110.3 ± 38.8 BC	1089.4 ± 444.9 B	95	54 A
PENNCAP M 2FM, 0.50+LORSBAN 4E, 0.38	6.8 ± 1.8 B	106.5 ± 38.6 C	128.5 ± 57.9 BC	1218.9 ± 458.4 B	95	44 A
PENNCAP M 2FM, 0.50+DIMETHOATE 4E, 0.25	39.8 ± 17.4 B	217.8 ± 67.4 BC	217.0 ± 106.3 BC	2422.9 ± 768.7 B	90	43 A
PENNCAP M 2FM, 0.50+DIMETHOATE 4E, 0.50	18.3 ± 6.7 B	222.0 ± 95.1 BC	224.5 ± 68.6 BC	2403.6 ± 917.2 B	90	52 A
PENNCAP M 2FM, 0.75	91.0 ± 32.1 B	732.5 ± 277.6 B	496.8 ± 175.7 B	7184.6 ± 2041.9 B	70	38 A
UNTREATED	672.8 ± 90.1 A	2456.88 ± 548.2 A	1186.1 ± 229.8 A	23704.2 ± 4739.8 A	—	40 A
F Value	23.61	19.90	14.49	9.58		3.04
$p > F$	< 0.0001	< 0.0001	< 0.0001	< 0.0001		0.0069

[1]SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not significantly different, SNK (á=0.05).
[2]Percent reduction in total aphid days, calculated by the Ruppel method.
[3]Yield presented in bushels/acre adjusted to 12% moisture.

CONTROL OF WHEAT CURL MITE IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, FRUITA RESEARCH CENTER, FRUITA, CO, 1999

Robert W. Hammon, Amber Richens, Fruita Research Center

CONTROL OF WHEAT CURL MITE IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, FRUITA RESEARCH CENTER, FRUITA, CO, 1999: Treatments were applied on 10 March 1999 with a hand held CO_2 powered sprayer calibrated to apply 25 gal/acre at 3 mph at 35 psi through three LF4 nozzles at 18 in spacing. Conditions were clear with winds of 0-3 mph and temperature was 50˚F at the time of treatment. Plots were 25 by 5 ft and were arranged in four replicates of a randomized complete block design. Crop stage at application was Zadoks 24.

Treatments were evaluated by collecting five randomly selected tillers per plot two days prior to treatment and 7, 14 and 21 days after treatment. Wheat curl mites were counted with the aid of a dissecting microscope. Precounts averaged 73.8 ± 19.5 wheat curl mites per tiller with 85% of tillers infested. Mite counts transformed with MSTAT-C by the log(x+1) method were used for analysis of variance and mean separation using the Student-Neuman-Keuls test (á=0.05). Original means are presented in the tables.

Mite pressure was severe. Furadan 4F was the only treatment with fewer mites than the untreated control at 14 and 21 days post treatment (Table 1). No treatment controlled wheat curl mite at 7 days post treatment. Furadan 4F was the only treatment that had less than 100 percent infested tillers at 14 and 21 days post treatment (Table 2). No phytotoxicity was observed with any treatment.

Field History

Pest:	Wheat curl mite, *Aceria tosichella* Keifer
Cultivar:	‘Stephens’
Planting Date:	17 August 1998
Irrigation:	Furrow
Crop History:	Wheat
Herbicide:	None
Insecticide:	None
Fertilization:	200 lb/a 18-46-0
Soil Type:	Youngston clay loam
Location:	Fruita Research Center, 1910 L Road, Fruita, CO, 81521

Table 1. Control of wheat curl mite in winter wheat, Fruita Research Center, Fruita, CO, 1999.

	MITES PER TILLER ± SEM[1]		
PRODUCT, LB (AI)/ACRE	**7 DAYS**	**14 DAYS**	**21 DAYS**
FURADAN 4F, 0.5	33.6 ± 24.8	9.9 ± 6.9 A	0.2 ± 0.2 A
CAPTURE 2EC, 0.10	142.1 ± 31.2	171.2 ± 41.6 B	165.8 ± 63.8 B
AGRI-MEK 0.15EC, 0.019	93.8 ± 42.4	92.0 ± 12.6 B	56.5 ± 28.0 B
SEVIN XLR, 1.0	57.2 ± 16.9	94.5 ± 39.7 B	53.8 ± 8.8 B
DIMETHOATE 4EC, 0.5	211.5 ± 162.1	168.5 ± 42.1 B	124.2 ± 39.9 B
UNTREATED	160.8 ± 77.8	148.5 ± 39.3 B	106.8 ± 36.3 B
F Value	2.33	11.98	33.42
p > F	0.0934	< 0.0001	< 0.0001

[1] SEM, standard error of the mean. Means in the same column followed by the same letter(s) are not significantly different, SNK (á=0.05).

Table 2. Control of wheat curl mite in winter wheat, percent infested tillers, Fruita Research Center, Fruita, CO, 1999.

	PERCENT INFESTED TILLERS		
PRODUCT, LB (AI)/ACRE	**7 DAYS**	**14 DAYS**	**21 DAYS**
FURADAN 4F, 0.5	75	45	5
CAPTURE 2EC, 0.10	100	100	100
AGRI-MEK 0.15EC, 0.019	100	100	100
SEVIN XLR, 1.0	100	100	100
DIMETHOATE 4EC, 0.5	100	100	100
UNTREATED	95	100	100

CONTROL OF BROWN WHEAT MITE IN WINTER WHEAT WITH HAND-APPLIED DIMETHOATE 4E, HORTH FARM, HUDSON, CO, 1999

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CONTROL OF BROWN WHEAT MITE IN WINTER WHEAT WITH HAND-APPLIED DIMETHOATE 4E, HORTH FARM, HUDSON, CO, 1999: Treatments were applied on 29 March and 18 May 1999 with a ‘rickshaw-type’ CO_2 sprayer calibrated to deliver 20 gal/acre at 30 psi through six 8004 (LF4) nozzles mounted on a 10 ft boom. Plots were 10 ft by 30 ft and arranged in six replicates of a randomized complete block design. Crop stage at application was tillering (Zadoks 26-27) and boot (Zadoks 47) respectively.

Treatments were evaluated by collecting mites in two-8 inch diameter areas per plot with a Vortis Suction Sampler before the first application (tillering, Zadoks 26-27), before the second application (boot, Zadoks 47) and two weeks after the second application (anthesis, Zadoks 69). Samples were placed on paper plates in Berlese funnels for 72 hours to extract the mites into alcohol for counting. Precounts averaged 1350 ± 966 mites per two-8 inch diameter suction samples. Mite counts transformed by the square root + ½ method were used for analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05). Original means are presented in the tables. One meter row of wheat was harvested and yield and test weights were determined. Mean total weight and seed weight were used for analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05).

Mite pressure was high despite the heavy rainfall that was received in the spring. Both treatments had fewer mites than the untreated control. There was no difference in total seed weight (F=0.97, df=7, p=0.5000) among the treated and untreated plots. Phytotoxicity was not observed with any treatment.

Field History:

Pest: Brown wheat mite, *Petrobia latens* (Müller)
Cultivar: 'Halt'
Planting Date: Unknown
Irrigation: None
Crop History: Fallow 1998
Herbicide: None
Insecticide: None
Fertilization: None
Soil type: Unknown
Location: Adams county, NW corner of 152nd Ave. and Watkins Rd.

Table 1. Control of brown wheat mite in winter wheat with hand-applied dimethoate 4E, Horth Farm, Hudson, CO, 1999.

TREATMENT	MITES PER SAMPLE ± SEM, AFTER FIRST TREATMENT[1]	MITES PER SAMPLE ±SEM, AFTER SECOND TREATMENT[1]
DIMETHOATE 4E, 29 MARCH	55 ± 23 B	245 ± 108 B
DIMETHOATE 4E, 18 MAY	747 ± 136 A	14 ± 2 C
UNTREATED	780 ± 187 A	585 ± 192 A
F value	10.86	4.01
p > F	0.0009	0.02

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

CONTROL OF ARMY CUTWORM IN WINTER WHEAT, REHOR FARM, JOES, CO, 1999

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CONTROL OF ARMY CUTWORM IN WINTER WHEAT, REHOR FARM, JOES, CO, 1999: Treatments were applied on 27 March 1999 with a CO_2 powered sprayer calibrated to apply 11.5 gal/acre through six 8002VS (TEEJET) nozzles mounted 18 inches apart on an 8 ft boom held 21 inches above the crop canopy. Conditions at the time of treatment were 60^o F with less than a 3 mph south wind and relative humidity of 20%. Plots were 10 ft by 50 ft and arranged in four replicates of a randomized complete block design.

Treatments were evaluated by counting live army cutworms found in a randomly selected area, which included a row of wheat on each side, within each plot that measured 1 ft by 2 ft by 4 inches deep, 3 and 10 days after treatment. Pre-counts averaged 4.5 army cutworm per 2 ft^2. Army cutworm counts were subjected to analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05).

All treatments had fewer army cutworms than the untreated control at both sample dates. There were no differences among treatments (Table 1). Moderate drought conditions existed until 5 April 1999 when 0.6 inches of precipitation was recorded. This climatic event probably increased the insecticidal activity of all treatments. No phytotoxicity was observed with any treatment.

Field History

Pest: Army cutworm, *Euxoa auxiliaris* (Grote)
Cultivar 'Quantum 7510'
Planting Date: 5 September 1998
Irrigation: None
Herbicide: None
Insecticide: None prior to experiment
Fertilization: 44 N, 50 P, 30 K
Soil Type: Sandy loam
Location: Section 19, 5 S, 47W, Yuma County

Table 1. Control of army cutworm in winter wheat, Rehor Farm, Joes, CO, 1999.

	29 MARCH 1999		06 APRIL 1999	
PRODUCT, RATE	**AC per 2ft^2 ± SEM[1]**	**% CONTROL**	**AC per 2ft^2 + SEM[1]**	**% CONTROL**
MUSTANG 1.5E, 0.03	0.0 ± 0.0 B	100	0.0 ± 0.0 B	100
WARRIOR 1T, 0.03	0.3 ± 0.3 B	96	0.0 ± 0.0 B	100
MUSTANG 1.5E, 0.025	1.0 ± 0.4 B	83	0.3 ± 0.3 B	95
WARRIOR 1T, 0.02	0.0 ± 0.0 B	100	0.3 ± 0.3 B	95
WARRIOR 1T, 0.015	1.5 ± 0.5 B	75	0.3 ± 0.3 B	95
BAYTHROID 2E, 0.03	0.3 ± 0.3 B	96	0.0 ± 0.0 B	95
BAYTHROID 2E, 0.02	0.5 ± 0.3 B	92	0.0 ± 0.0 B	95
LORSBAN 4E, 0.05	0.8 ± 0.5 B	88	1.0 ± 0.4 B	80
UNTREATED	5.3 ± 1.3 A	---	4.8 ± 1.0 A	---
F Value	4.908	---	9.079	---
p > F	0.0006	---	< 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 (á=0.05).

CONTROL OF PALE WESTERN CUTWORM AND ARMY CUTWORM IN WINTER WHEAT, PERRY FARM, OTIS, CO, 1999

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CONTROL OF PALE WESTERN CUTWORM AND ARMY CUTWORM IN WINTER WHEAT, PERRY FARM, OTIS, CO, 1999: Treatments were applied 12 April 1999 with a CO_2 powered sprayer calibrated to apply 11.5 gal/acre through six 8002VS (TeeJet) nozzles mounted 18 inches apart on an 8 ft boom held 21 inches above the crop canopy. Conditions at the time of treatment were 55^{o}F with a 3 mph south wind and a relative humidity of 40%. Plots were 10 ft by 50 ft and arranged in four replicates of a randomized complete block design.

Treatments were evaluated by counting live army and pale western cutworms found in a randomly selected area, which included a row of wheat on each side within each plot, that measured 1 ft by 4 ft by 4 inches deep, 7 and 13 days after treatment. Pre-counts averaged 2.5 army cutworm and 1.5 pale western cutworm per 1ft^2. Army and pale western cutworm counts were subjected to analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05).

All treatments had fewer pale western cutworms than the untreated control at both sample dates. There were no differences among treatments (Table 1). Migrant pale western cutworm pressure was observed and may have influenced the counts at 13 days post treatment in plots closest to the untreated control. No phytotoxicity was observed with any treatment.

All treatments had fewer army cutworms than the untreated control at 7 days post treatment. There were no differences among treatments (Table 2). Army cutworm counts at 13 days post treatment were not subjected to analysis due to migratory pressure and pupation of 80% of the population. No phytotoxicity was observed with any treatment.

Field History

Pest:	Army cutworm, *Euxoa auxiliaris* (Grote) Pale western cutworm, *Agrotis orthogonia* (Morrison)
Cultivar	'Jagger'
Planting Date:	14 October 1998
Irrigation:	None
Herbicide:	None
Insecticide:	None prior to experiment
Fertilization:	25 N, 15 P
Soil Type:	Clay loam
Location:	Section 23, 5 N 50W, Washington County

Table 1. Control of pale western cutworm in winter wheat, Perry Farm, Otis, CO, 1999.

	19 APRIL 1999		25 APRIL 1999	
PRODUCT, RATE	**PWC per 1ft^2 ± SEM[1]**	**% CONTROL**	**PWC per 1ft^2 [1]**	**% CONTROL**
WARRIOR 1T, 0.03	0.8 ± 0.3 B	88	0.3 B	96
MUSTANG 1.5E, 0.03	1.0 ± 0.4 B	84	0.5 B	93
MUSTANG 1.5E, 0.025	1.8 ± 0.8 B	72	0.8 B	89
BAYTHROID 2E, 0.02	0.5 ± 0.5 B	92	1.0 B	85
WARRIOR 1T, 0.02	0.0 ± 0.0 B	96	1.3 B	81
BAYTHROID 2E, 0.03	0.5 ± 0.5 B	92	1.5 B	78
WARRIOR 1T, 0.015	1.5 ± 0.3 B	76	1.8 B	74
LORSBAN 4E, 0.5	0.5 ± 0.5 B	92	2.0 B	70
UNTREATED	6.5 ± 0.7 A	---	6.4 A	---
F Value	15.203		17.808	
p > F	< 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 (á=0.05).

Table 2. Control of army cutworm in winter wheat, Perry Farm, Otis, CO, 1999.

	19 APRIL 1999	
PRODUCT, RATE	AC per 1ft^2 ± SEM[1]	% CONTROL
BAYTHROID 2E, 0.03	0.3 ± 0.3 B	94
BAYTHROID 2E, 0.02	0.3 ± 0.3 B	94
LORSBAN 4E, 0.5	0.5 ± 0.3 B	89
MUSTANG 1.5E, 0.03	0.5 ± 0.3 B	89
MUSTANG 1.5E, 0.025	0.5 ± 0.5 B	89
WARRIOR 1T, 0.02	0.8 ± 0.3 B	83
WARRIOR 1T, 0.03	1.0 ± 0.4 B	78
WARRIOR 1T, 0.015	1.0 ± 0.7 B	78
UNTREATED	3.9 ± 0.8 A	---
F Value	17.808	---
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 (á=0.05).

CONTROL OF ALFALFA INSECTS WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1999

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CONTROL OF ALFALFA INSECTS WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1999: Treatments were applied on 27 May 1999 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 overcast with winds from the north at 3-5 mph and temperature was 55EF 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 two days prior to treatment by taking 100, 180 degree sweeps per replication. Alfalfa weevil larvae, alfalfa weevil adults and pea aphids were counted. Precounts averaged 15.2 ± 2.0 alfalfa weevil larvae, 0.2 ± 0.1 alfalfa weevil adults and 34.4 ± 5.5 pea aphids per 10 sweeps. Insect counts transformed by the square root + ½ method were used for analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05). Original means are presented in the tables.

Lady beetles *(Coccinelidae)*, nabids *(Nabidae)* and spiders *(Arachnida)* were sampled to determine if Steward treatments affected beneficial insects while controlling alfalfa insects. Treatments were evaluated by taking 10-180 degree sweeps per plot with a standard 15 inch diameter insect net. Beneficial insects were counted one, two and three weeks after treatment. Beneficial insect counts transformed by the square root + ½ method were used for analysis of variance and mean separation by the Student-Neuman-Keuls test (á=0.05). Original means are presented in the tables.

Alfalfa weevil pressure was moderate and pea aphid pressure was high. All treatments had fewer alfalfa weevil larvae than the untreated control at one, two and three weeks after treatment. All treatments had fewer alfalfa weevil adults than the untreated control at three weeks after treatment. No treatment had fewer pea aphids than the untreated control at three weeks after treatment. No phytotoxicity was observed with any treatment. The plots treated with Furadan 4F, 0.50 lb(AI)/acre yielded 6.8% more than the untreated plots but the difference was not significant (two-tailed t-test, t=1.9570, df=14, $p(t>t_{0.05})$ =0.0706). Yield reduction measured since 1995 has averaged 6.8%, with a range of 2.3% to 10.9%.

Beneficial insect counts in Steward treated plots were not significantly different than the untreated control (Tables 4-6) exceptions are the high rate of Steward at 2 and 3 weeks for coccinellids and spiders, respectively. Too few lacewings (*Chrysopidae*, 0.22 per 10 sweeps) and syrphids (*Syrphidae*, 0.03 per 10 sweeps) were collected for meaningful statistical analysis.

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:	Sandy Clay Loam, OM 1.8%, pH 8.0
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO, 80524 (Block 1030)

Table 1. Control of alfalfa weevil larvae, ARDEC, Fort Collins, CO, 1999.

	ALFALFA WEEVIL LARVAE PER 10 SWEEPS ± SEM[1]		
PRODUCT, LB (AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**
WARRIOR 1E, 0.02	2.3 ± 0.5 C	6.5 ± 2.9 F	1.0 ± 0.7 D
BAYTHROID 2E, 0.025	5.0 ± 2.0 C	7.3 ± 1.9 EF	0.8 ± 0.5 D
LORSBAN 4E, 0.75	2.5 ± 1.0 C	7.5 ± 1.9 EF	10.3 ± 2.2 C
STEWARD, 0.110	2.0 ± 1.0 C	11.3 ± 1.5 DEF	10.0 ± 1.6 C
FURADAN 4F, 0.50+POUNCE 3.2E, 0.075	4.8 ± 1.6 C	14.8 ± 3.8 DEF	11.3 ± 1.6 C
STEWARD, 0.065	12.5 ± 3.4 C	26.5 ± 4.4 CDEF	16.5 ± 3.2 BC
FURADAN 4F, 0.50+DIMETHOATE 4E, 0.25	10.0 ± 3.9 C	29.0 ± 6.4 CDEF	15.5 ± 1.2 BC
FURADAN 4F, 0.50[2]	16.1 ± 3.9 C	34.9 ± 6.0 CDE	20.4 ± 3.2 BC
STEWARD, 0.025	15.8 ± 2.8 C	39.0 ± 4.4 CD	17.8 ± 5.3 BC
PENNCAP M 2FM, 0.75	61.8 ± 13.4 B	48.8 ± 5.2 C	12.8 ± 2.4 C
FURADAN 4F, 0.25	46.8 ± 8.1 B	92.5 ± 17.7 B	30.0 ± 5.7 B
UNTREATED[2]	327.5 ± 25.8 A	237.0 ± 33.8 A	58.5 ± 7.3 A
F Value	81.87	29.52	19.38
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 (á=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, 1999.

	ALFALFA WEEVIL ADULTS PER 10 SWEEPS ± SEM[1]		
PRODUCT, LB(AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**
STEWARD, 0.110	0.0 ± 0.0	1.3 ± 0.6 C	3.3 ± 1.3 B
PENNCAP M 2FM, 0.75	0.3 ± 0.3	2.5 ± 0.3 BC	4.0 ± 0.8 B
STEWARD, 0.065	0.0 ± 0.0	2.8 ± 0.8 BC	3.0 ± 1.1 B
STEWARD, 0.025	0.8 ± 0.5	3.0 ± 1.2 BC	4.3 ± 1.7 B
FURADAN 4F, 0.50[2]	1.0 ± 0.4	5.4 ± 1.0 ABC	4.1 ± 0.8 B
FURADAN 4F, 0.50+POUNCE 3.2E, 0.075	0.3 ± 0.3	6.3 ± 0.9 AB	5.5 ± 1.4 B
LORSBAN 4E, 0.75	0.8 ± 0.3	6.8 ± 1.7 AB	7.3 ± 2.2 B
FURADAN 4F, 0.50+DIMETHOATE 4E, 0.25	0.8 ± 0.5	6.8 ± 1.3 AB	4.5 ± 1.0 B
UNTREATED[2]	1.4 ± 0.4	7.8 ± 1.5 AB	15.4 ± 2.0 A
FURADAN 4F, 0.25	1.5 ± 0.9	7.5 ± 2.1 AB	4.3 ± 2.1 B
BAYTHROID 2E, 0.025	1.8 ± 1.4	9.8 ± 1.9 A	7.5 ± 1.5 B
WARRIOR 1E, 0.02	1.5 ± 0.9	12.3 ± 3.1 A	5.3 ± 0.6 B
F Value	0.95	4.41	4.74
p > F	0.5127	< 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 (á=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, 1999.

	PEA APHIDS PER 10 SWEEPS ± SEM[1]		
PRODUCT, LB(AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**
WARRIOR 1E, 0.02	21.3 ± 3.9 C	93.5 ± 11.7 E	15.8 ± 5.1 A
FURADAN 4F, 0.50+POUNCE 3.2E, 0.075	74.3 ± 7.1 BC	237.5 ± 26.5 CD	9.8 ± 3.3 A
PENNCAP M 2FM, 0.75	109.8 ± 19.1 B	182.0 ± 27.7 DE	19.8 ± 2.7 A
LORSBAN 4E, 0.75	122.3 ± 23.9 B	371.8 ± 46.8 CD	14.8 ± 10.1 A
BAYTHROID 2E, 0.025	166.8 ± 15.5 B	370.0 ± 52.1 CD	24.3 ± 11.1 A
FURADAN 4F, 0.50+DIMETHOATE 4E, 0.25	184.5 ± 31.0 B	321.5 ± 59.0 CD	13.8 ± 8.6 A
UNTREATED[2]	535.9 ± 110.8 A	344.1 ± 59.0 CD	9.8 ± 1.9 A
FURADAN 4F, 0.50[2]	531.1 ± 54.0 A	676.4 ± 108.3 AB	16.0 ± 3.7 A
FURADAN 4F, 0.25	588.8 ± 118.1 A	762.8 ± 134.7 AB	11.8 ± 3.5 A
STEWARD, 0.025	655.5 ± 177.7 A	509.8 ± 124.2 BC	14.3 ± 3.0 A
STEWARD, 0.110	657.5 ± 138.9 A	796.8 ± 161.4 AB	19.3 ± 11.0 A
STEWARD, 0.065	782.8 ± 110.7 A	1003.3 ± 171.7 A	19.5 ± 7.0 A
F Value	22.06	14.17	4.83
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 (á=0.05)
[2]Treatment repeated (8 replicates rather than 4) for purposes of measuring yield.

Table 4. Effect of Steward treatments on coccinellids, ARDEC, Fort Collins, CO, 1999.

	LADY BEETLES PER 10 SWEEPS ± SEM[1]		
PRODUCT, LB, (AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**
STEWARD, 0.110	1.3 ± 0.6 A	9.8 ± 3.3 B	21.8 ± 3.5 A
STEWARD, 0.025	3.8 ± 1.3 A	18.5 ± 3.2 AB	16.5 ± 3.3 A
STEWARD, 0.065	1.5 ± 0.6 A	20.5 ± 4.1 AB	14.8 ± 4.5 A
UNTREATED[2]	3.9 ± 1.1 A	24.6 ± 3.9 A	21.9 ± 2.0 A
F Value	1.13	3.10	1.05
p > F	0.3960	0.0413	0.4368

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

Table 5. Effect of Steward treatments on nabids, ARDEC, Fort Collins, CO, 1999.

	NABIDS PER 10 SWEEPS ± SEM[1]		
PRODUCT, LB, (AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**
UNTREATED[2]	0.4 ± 0.3 A	1.6 ± 0.4 A	5.0 ± 1.0 A
STEWARD, 0.110	0.5 ± 0.3 A	0.8 ± 0.3 A	5.8 ± 1.4 A
STEWARD, 0.025	0.5 ± 0.3 A	0.5 ± 0.5 A	5.3 ± 1.0 A
STEWARD, 0.065	0.8 ± 0.5 A	1.3 ± 0.8 A	6.5 ± 1.7 A
F Value	1.17	0.88	0.48
p > F	0.3798	0.5388	0.8150

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

Table 6. Effect of Steward treatments on spiders, ARDEC, Fort Collins, CO, 1999.

	SPIDERS PER 10 SWEEPS ± SEM[1]		
PRODUCT, LB, (AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**
STEWARD, 0.110	1.0 ± 0.4 A	2.0 ± 0.7 A	1.8 ± 0.9 B
UNTREATED[2]	1.9 ± 0.4 A	2.1 ± 0.5 A	3.0 ± 0.4 AB
STEWARD, 0.025	3.0 ± 1.6 A	2.8 ± 0.5 A	4.0 ± 1.1 AB
STEWARD, 0.065	1.3 ± 0.9 A	2.8 ± 0.9 A	5.0 ± 1.1 A
F Value	1.36	0.55	2.21
p > F	0.2990	0.7603	0.1084

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

CONTROL OF ALFALFA INSECTS WITH PROPANE FLAMING AT TWO LOCATIONS IN NORTHEAST COLORADO, 1999

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CONTROL OF ALFALFA INSECTS WITH PROPANE FLAMING AT TWO LOCATIONS IN NORTHEAST COLORADO, 1999: Propane flaming was performed on 10 March 1999 at the Prior farm near Eaton, CO. Conditions were east to northeast winds at 3 mph and temperature of 60EF at the time of treatment. Lorsban 4E, 0.75 lb(ai)/acre was applied on 18 May 1999 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 overcast with winds from the north at 3-5 mph and temperature was 55EF at the time of treatment. Plots consisted of one 60 ft by 300 ft chemically treated plot, one 60 ft by 300 ft untreated plot and the remainder of the field was flamed. All treatments were unreplicated.

Propane flaming was performed at the Murray farm near Brighton, CO on 10 March 1999. Conditions were overcast with winds 4-6 mph with gusts to 12 mph. Baythroid was applied aerially on 15 May 1999. Plots consisted of one 60 ft by 300 ft flamed plot, one 60 ft by 300 ft untreated plot and the remainder of the field was treated with Baythroid. All treatments were unreplicated.

Treatments were evaluated by taking 5, 5-second samples with a Vortis Suction Sampler every 10 ft along a transect perpendicular to the plots every two weeks from 1 March through 14 May 1999. On 26 May, 10, 180 degree sweep samples were taken in the same locations. Alfalfa weevil larvae, alfalfa weevil adults and pea aphids were counted. Each location's counts from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (á=0.05). Yields were taken at both locations on 3 June 1999 with a forage harvester which cuts and weighs a 4 ft swath of alfalfa. Swaths were collected at 6 locations within each treatment.

Yields were higher in the flamed plot than in the untreated control at the Prior Farm (Table 1). Yields were lower than the untreated control in both the flamed and Lorsban plots at the Murray Farm (Table 1). Propane flaming did not reduce the total number of alfalfa weevils or pea aphids at either location (Figures 1 and 2).

Field History

Pests:	Alfalfa weevil, *Hypera postica* (Gyllenhal)
	Pea aphid, *Acyrthosiphon pisum* (Harris)
Cultivar:	Unknown
Insecticide:	None prior to experiment
Soil Type:	Unknown
Location:	Prior Farm, 36390 Weld County Rd 29, Eaton, CO
	Murray Farm, 11020 Havana St, Brighton, CO

Table 1. Effect of propane flaming on alfalfa yield at three locations in northeast Colorado, 1999.

LOCATION	TREATMENT	YIELD[1,2]
MURRAY FARM	UNTREATED	1.9
MURRAY FARM	BAYTHROID	1.5 (0.0002)
MURRAY FARM	PROPANE FLAMING	1.3 (< 0.0001)
PRIOR FARM	PROPANE FLAMING	2.7 (0.0052)
PRIOR FARM	LORSBAN 4E, 0.75 LB(AI)/ACRE	2.5 (0.2108)
PRIOR FARM	UNTREATED	2.4

[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 (á=0.05).
[2]Yield in tons per acre adjusted to average subsample moisture by location.

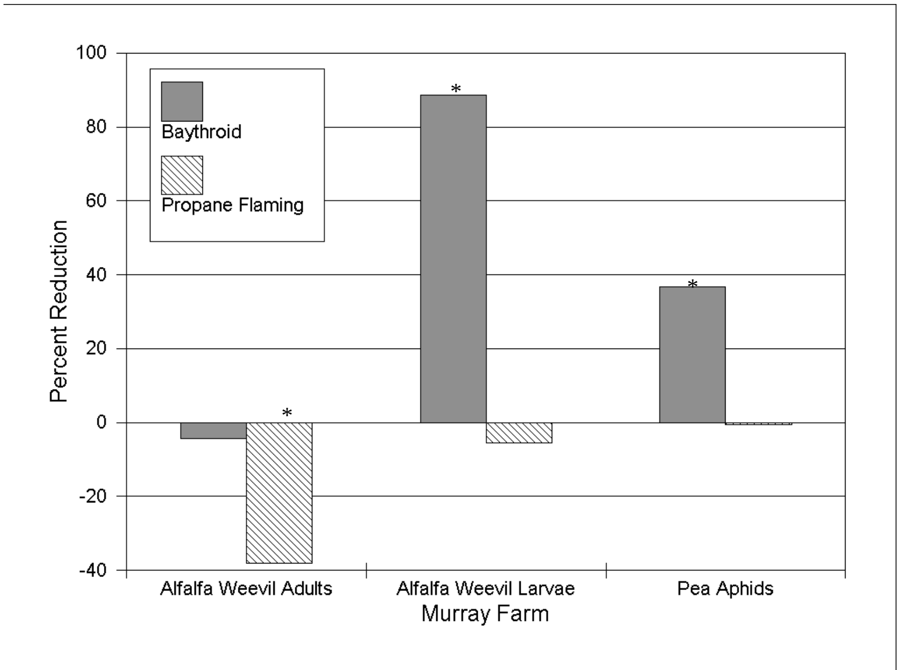

Figure 1. Percent reduction in pest abundance for each treatment as relative to the untreated control, Murray Farm, Brighton, CO, 1999.
* Indicates mean is different from the untreated control, calculated with a two-tailed t-test with assumed equal variance (á=0.05).

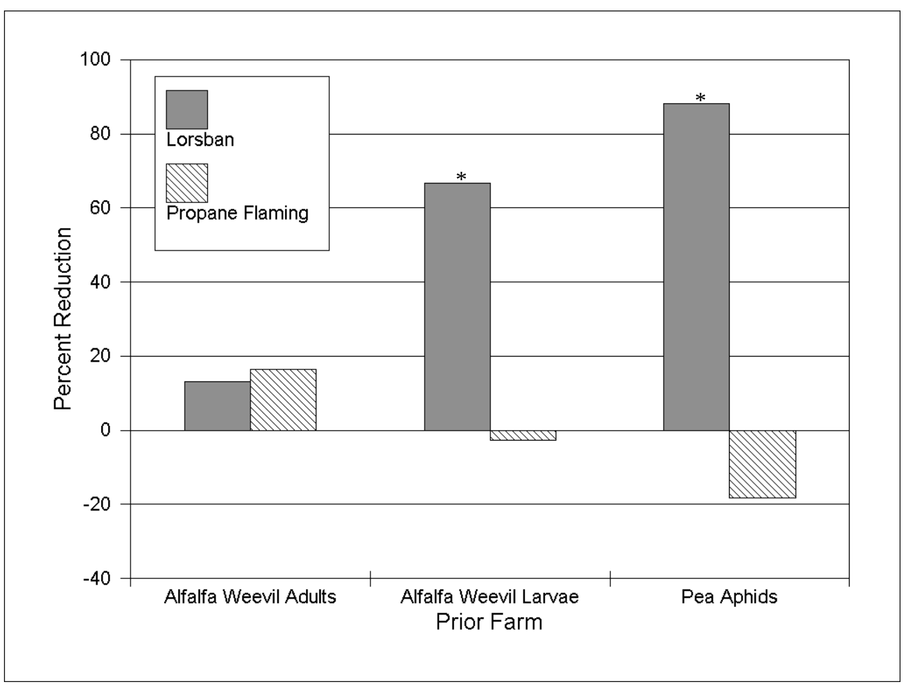

Figure 2. Percent reduction in pest abundance for each treatment as relative to the untreated control, Prior Farm, Eaton, CO, 1999.
* Indicates mean is different from the untreated control, calculated with a two-tailed t-test with assumed equal variance (á=0.05).

CONTROL OF WESTERN CORN ROOTWORM, BOHM FARM, ECKLEY, CO, 1999

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CONTROL OF WESTERN CORN ROOTWORM, BOHM FARM, ECKLEY, CO, 1999: Planting time treatments were applied on 28 April 1999. Granular insecticides were applied with modified Wintersteiger meters mounted on a two-row John Deere Maxi-Merge planter. In-furrow granular applications were applied by directing a drop tube into the seed furrow. T-band granular applications were applied with a 4-inch John Deere spreader located between the disk openers and the press wheel. Liquid insecticides were applied with a CO_2 powered applicator mounted on the planter. In-furrow liquid applications were applied through microtubes directed into the seed furrow ½ inch above the seed. T-band liquid applications were applied with a 80E nozzle held 2 inches above the seed slot located between the disk openers and the press wheel. Plots were one 50-ft row arranged in six replicates of a randomized complete block design.

Cultivation treatments were applied on 7 June 1999. Broadcast cultivation treatments were applied with a CO_2 powered hand-held sprayer calibrated to deliver 23 gal/acre at 30 psi through four 80015 TJ VS nozzles. All other cultivation treatments were applied with 6 inch Gandy spreaders held 2 inches above the plant, incorporated with an Orthman cultivator. Broadcast Furadan 4F plots were two 50-ft rows arranged in six replicates of a randomized complete block design. All other plots were one 50-ft row arranged in six replicates of a randomized complete block design.

Seed treatments were planted on 2 May 1999 at a plant population of 32,000 per acre using a Kincaid cone planting system mounted on a two-row John Deere Maxi-Merge planter. Plots were one 50-ft row arranged in six replicates of a randomized complete block design.

All planting and cultivation western corn rootworm treatments were evaluated by digging three plants per plot on 12 July 1999. Seed treatments were evaluated by digging six 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 used for analysis of variance and mean separation by the Student-Neuman-Keuls test (á=0.05). Treatment efficiency was determined as the percentage of samples with a root rating of 3.0 or lower.

Western corn rootworm pressure was heavy. Aztec 2.1, Regent 4SC and Force 3G planting time treatments had less damage than the untreated control (Table 1). Counter 15G and Counter 20CR cultivation treatments had less damage than the untreated control (Table 2). All seed treatments had less damage than the untreated control (Table 3) but there were no differences among treatments. No phytotoxicity was observed with any treatment.

Planting time Counter 20CR treatments yielded 1.3% more than the untreated plots but the difference was not significant (two-tailed t-test, t=0.5482, df=28, $p(t>t_{0.05})$ =0.5879). Yield reduction measured between 1987-1999 have averaged 15%, with a range of 0% to 31%. Plots were hand harvested and did not take into account any losses due to lodging.

Field History

Pest:	Western corn rootworm, *Diabrotica virgifera virgifera* LeConte
Cultivar:	
Seed Treatments:	Provided by company
Other Treatments:	Pioneer '34K77'
Planting Date:	
Seed Treatments:	2 May 1999
Other Treatments:	28 April 1998
Plant Population:	32,000
Irrigation:	Sprinkler
Crop History:	Field corn since 1996
Herbicide:	14 oz/A-Basis Gold, 4 oz/A-Clarity
Insecticide:	None prior to experiment
Fertilization:	180 N, 15 P, 8 S
Soil Type:	Haxtun sandy loam, OM 1.1%, pH 6.5
Location:	Yuma County, NE ¼, Section 17, 4N-46W

Table 1. Control of western corn rootworm with planting-time treatments, Bohm Farm, Eckley, CO, 1999

PRODUCT	RATE	VOLUME	PLACEMENT	ROOT RATING[1,2]	EFFICIENCY[3]
AZTEC 2.1	6.7/1000	—	TB	2.5 C	89
REGENT 4SC	4.2 oz/ac	3 gal	IF	2.8 BC	89
FORCE 3G	4.0	—	TB	2.8 BC	78
REGENT 4SC	4.2 oz/ac	1 gal	IF	3.0 BC	72
REGENT 4SC	4.2 oz/ac	2 gal	IF	3.2 BC	78
FORCE 3G	5.0	—	TB	3.4 BC	50
COUNTER 20CR	6.0	—	TB	3.8 ABC	28
FORTRESS 5.0G	3.0	—	IF	3.9 ABC	6
COUNTER 20CR	6.0	—	IF	4.1 AB	17
LORSBAN 15G	8.0	—	TB	4.2 AB	33
UNTREATED	—	—	—	5.1 A	4
F Value				5.06	—
p > F				< 0.0001	—

[1]Means in the same column followed by the same letter(s) are not statistically different, SNK (á=0.05).
[2]Iowa 1-6 rootworm damage scale. Means followed by the same letter(s) are not statistically different SNK (á=0.05).
[3]Percentage of 18 plants (total in 6 replicates of treatment) with a rating of 3.0 or less

Table 2. Control of western corn rootworm with cultivation-time treatments, Bohm Farm, Eckley, CO, 1999

PRODUCT	RATE	PLACEMENT	ROOT RATING[1,2]	EFFICIENCY[3]
COUNTER 15G	8.0	—	3.1 C	56
COUNTER 20CR	6.0	—	3.3 C	61
FURADAN 4.0F	1.0	Broadcast, incorporated	3.8 ABC	28
AZTEC 2.1G	6.7	—	4.1 ABC	22
FORCE 3G	4.0	—	4.1 ABC	17
FURADAN 4.0F	1.0	Broadcast, not incorporated	4.2 ABC	19
THIMET 20G	6.0	—	4.5 AB	17
UNTREATED	—	—	5.0 A	0
F Value			2.06	
p > F			0.0396	

[1]Means in the same column followed by the same letter(s) are not statistically different, SNK (á=0.05).
[2]Iowa 1-6 rootworm damage scale. Means followed by the same letter(s) are not statistically different SNK (á=0.05).
[3]Percentage of 18 plants (total in 6 replicates of treatment) with a rating of 3.0 or less

Table 3. Control of western corn rootworm with seed treatments, Bohm Farm, Eckley, CO, 1999

PRODUCT	RATE	PLACEMENT	ROOT RATING[1,2]	EFFICIENCY[3]	YIELD[1,4]
FORCE 3G	4.0	T-band	2.7 B	86	217 A
COUNTER 20CR	6.0	T-band	2.8 B	75	192 A
LORSBAN 15G	8.0	T-band	3.1 B	50	215 A
AZTEC 2.1	6.7/1000	T-band	3.3 B	58	204 A
FORCE SEED TREATMENT 4A	—	—	3.6 B	39	194 A
FORCE SEED TREATMENT 2A	—	—	3.7 B	36	198 A
FORCE SEED TREATMENT 3A	—	—	3.8 B	31	200 A
UNTREATED	—	—	4.8 A	0	185 A
F Value			3.45	—	2.16
p > F			0.0021	—	0.0383

[1]Means in the same column followed by the same letter(s) are not statistically different, SNK (á=0.05).
[2]Iowa 1-6 rootworm damage scale. Means followed by the same letter(s) are not statistically different SNK (á=0.05).
[3]Percentage of 18 plants (total in 6 replicates of treatment) with a rating of 3.0 or less.
[4]Yield in bushels per acre at 15.5% moisture.

CONTROL OF FIRST GENERATION EUROPEAN CORN BORER WITH CHEMIGATED INSECTICIDES, DRYDEN FARM, WRAY, CO, 1999

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CONTROL OF FIRST GENERATION EUROPEAN CORN BORER WITH CHEMIGATED INSECTICIDES, DRYDEN FARM, WRAY, CO, 1999: Treatments were applied on 19 July 1999 with a Milton Roy - Model B chemigation pump through a Lockwood sprinkler equipped with Senninger 360^o nozzles on 18 inch drops. All insecticides were diluted to the rate of 0.28 gallons per acre and applied in 0.3 inch irrigation water per acre. Plots were unreplicated and consisted of 25 acres treated with Capture 2E, 0.08, 33 acres treated with Capture 2E, 0.06, 73 acres treated with Warrior T, 0.03, and 7 acres untreated. Crop stage at application was late whorl.

At the time of application, 35% of the plants were symptomatic with live 1st - 5th instar larvae. Colorado State University research trials have shown that economic injury with first generation European corn borer generally occurs when 25% percent of the plants have feeding damage with live larvae present in the whorls.

Treatments were evaluated by splitting six groups of 5 symptomatic plants per treatment from the flag leaf to the first node above the ground and counting pupae and vacant cavities on 10 August 1999. Counts from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (á=0.05).

All treatments had fewer European corn borers than the untreated control. There were no differences among treatments (Table 1). No phytotoxicity was observed with any treatment.

Field History

Pest:	European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	GH 2547
Planting Date:	9 May 1999
Plant Population:	33,000
Irrigation:	Lockwood sprinkler
	Senninger 360^o nozzles on 18 inch drops
Crop History:	Continuous corn, 3 years
Herbicide:	Basis Gold - 14 oz/acre, Tough - 1.5 pt/acre
Insecticide:	None prior to experiment
Fertilization:	210 N, 91 P, 23 K, 2 S, 8 Zn
Soil Type:	Valentine sandy loam, OM 1.0%, pH 6.5
Location:	Yuma County, NW ¼ Section 1, 2N 53W

Table 1. Control of first generation European corn borer with chemigated insecticides, Dryden Farm, Wray, CO, 1999.

PRODUCT, LB (AI)/ACRE	LARVAE/PLANT[1]	% CONTROL
CAPTURE 2E, 0.08	0.3 (< 0.0001)	84
CAPTURE 2E, 0.06	0.3 (< 0.0001)	82
WARRIOR T, 0.03	0.5 (< 0.0001)	74
UNTREATED	1.8	---

[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 (á=0.05).

CHEMIGATED AND AERIALLY APPLIED INSECTICIDES FOR CONTROL OF FIRST GENERATION EUROPEAN CORN BORER, DRYDEN FARM, WRAY, CO, 1999

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CHEMIGATED AND AERIALLY APPLIED INSECTICIDES FOR CONTROL OF FIRST GENERATION EUROPEAN CORN BORER, DRYDEN FARM, WRAY, CO, 1999: Chemigated treatments were applied on 18 July 1999 with a Milton Roy - Model B chemigation pump through a Lockwood sprinkler equipped with Senninger 360^o nozzles on 18 inch drops. All insecticides were diluted to the rate of 0.28 gal/acre and applied in 0.3 inch irrigation water per acre. Aerial treatments were applied on 18 July 1999 with a Grumman Ag Cat Model G164A aircraft calibrated to apply 3 and 5 gpa over a 55 ft effective swath through 30 CP nozzles (0.125 orifice size set at 90^o shear at 30 psi and 0.191 orifice size set at 90^o shear at 32 psi, respectively) at an airspeed of 120 mph. Conditions were temperature 75^{o}F, relative humidity 35% and SSW winds at 1-3 mph at the time of treatment. Chemigated plot was 65 acres with a seven acre untreated zone maintained in the north ½ of the field. Aerial plots were six or more swath widths by the length of the field with a six swath width untreated zone maintained in the south ½ of the field. All treatments were unreplicated. Crop stage at application was late whorl.

At the time of application, 35% of the plants were symptomatic with live 1st - 5th instar larvae with 20% of the 5th instar larvae moving down the plant and making cavities. Colorado State University research trials have shown that economic injury with first generation European corn borer generally occurs when 25% percent of the plants have feeding damage with live larvae present in the whorls.

Treatments were evaluated by splitting five groups of 5 symptomatic plants per treatment from the flag leaf to the first node above the ground and counting pupae and completed vacant cavities on 10 August 1999. Counts from treated plots were compared to the other treatments and the untreated control using a two-tailed t-test with assumed equal variance (á=0.05).

All treatments had fewer European corn borers than the untreated control (Table 1). There were no differences among treatments (Table 1). No phytotoxicity was observed with any treatment.

Field History

Pest:	European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	GH 2547
Planting Date:	11 May 1999
Plant Population:	33,000
Irrigation:	Lockwood sprinkler Senninger 360^o nozzles on 18 inch drops
Crop History:	Continuous corn, 3 years
Herbicide:	Basis Gold - 14 oz/acre , Tough - 1.5 pints/acre
Insecticide:	None prior to experiment
Fertilization:	210 N, 91 P, 23 K, 12 S, 8 Zn
Soil Type:	Valentine sandy loam, OM 1.0%, pH 6.5
Location:	Yuma County, SW ¼ Section 1, 2N 53W

Table 1. Chemigated and aerially applied insecticides for control of first generation European corn borer, Dryden Farm, Wray, CO, 1999.

PRODUCT, LB (AI)/ACRE, DELIVERY	LARVAE/ PLANT[1]	TREATMENT COMPARISON[1]				% CONTROL
		LORSBAN 4E, 1.0 CHEMIGATED	LORSBAN 4E, (5 gal /acre), AERIAL	LORSBAN 4E, (3 gal /acre), AERIAL	UNTREATED	
LORSBAN 4E, 1.0, CHEMIGATED	0.4	---	0.1905	0.2398	< 0.0001	75
LORSBAN 4E, 1.0, (5 gal/acre), AERIAL	0.7	0.1905	---	0.8642	< 0.0001	61
LORSBAN 4E, 1.0, (3 gal/acre), AERIAL	0.7	0.2398	0.8642	---	< 0.0001	59
UNTREATED	1.6	< 0.0001	< 0.0001	< 0.0001	---	---

[1]Number indicates probability of the two treatment means being similar, calculated with a two-tailed t-test with assumed equal variance (á=0.05).

CONTROL OF FIRST GENERATION EUROPEAN CORN BORER WITH HAND APPLIED RH-2485 2F + LATRON CS-7, GARDNER FARM, ECKLEY, CO, 1999

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CONTROL OF FIRST GENERATION EUROPEAN CORN BORER WITH HAND APPLIED RH-2485 2F + LATRON CS-7, GARDNER FARM, ECKLEY, CO, 1999: Treatments were applied on 8 July 1999 with a CO_2 powered back-pack sprayer calibrated to deliver 17.6 gal/acre at 30 psi through four 11002VS Teejet nozzles mounted on a 6 ft boom held at whorl height during the application. Plots were 3 rows by 30 ft separated by a single buffer row and arranged in four replicates of a randomized complete block design. Crop stage at application was late whorl.

At the time of application, 22% of the plants were symptomatic with live 1st and 2nd instar larvae. Colorado State University research trials have shown that economic injury with first generation European corn borer generally occurs when 25% percent of the plants have feeding damage with live larvae present in the whorls.

Treatments were evaluated by splitting 10 symptomatic plants in each plot and counting pupae and vacant cavities on 17 August 1999. Counts were subjected to analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05).

All treatments had fewer European corn borers than the untreated control. There were no differences among treatments (Table 1). No phytotoxicity was observed with any treatment.

Field History

Pest:	European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	Pioneer ‘34A55'
Planting Date:	3 May 1999
Plant Population:	32,000
Irrigation:	Lockwood sprinkler Nelson drops, 360^o rotors
Crop History:	Continuous corn, 3 years
Herbicide:	Balance - 0.94 oz(AI)/acre
Insecticide:	None prior to experiment
Fertilization:	230 N, 45 P, 15 S, 3 K
Soil Type:	Valentine sandy loam, OM 1.0%, pH 6.5
Location:	Yuma County, SW ¼ Section 21, 2N 46W

Table 1. Control of first generation European corn borer with hand applied RH-2485 2F + Latron CS-7, Gardner Farm, Eckley, CO, 1999.

PRODUCT, LB (AI)/ACRE	LARVAE/PLANT ± SEM[1]	% CONTROL
RH-2485 2F, 0.06 + LATRON CS-7	0.1 ± 0.1 B	80
RH-2485 2F, 0.12 + LATRON CS-7	0.2 ± 0.1 B	60
POUNCE 3.2E, 0.15	0.2 ± 0.1 B	60
UNTREATED	0.5 ± 0.1 A	---
F value	7.34	---
p > F	0.0047	---

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

CONTROL OF SECOND GENERATION EUROPEAN CORN BORER WITH HAND APPLIED RH-2485 2F + LATRON CS-7, DRYDEN FARM, WRAY, CO, 1999

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CONTROL OF SECOND GENERATION EUROPEAN CORN BORER WITH HAND APPLIED RH-2485 2F + LATRON CS-7, DRYDEN FARM, WRAY, CO, 1999: Treatments were applied on 13 August 1999 with a CO_2 powered backpack sprayer calibrated to deliver 17.6 gal/acre at 30 psi through four 11002VS Teejet nozzles mounted on a 6 ft boom held at tassel height during the application. Plots were three rows by 30 ft separated by a single buffer row and arranged in four replicates of a randomized complete block design.

At the time of application the accumulated egg mass count was 40% plants infested with egg masses. Colorado State University research trials have shown that economic injury with second generation European corn borer occurs when weekly scouting has accumulated a total of 25% of plants with egg masses during pollination.

Treatments were evaluated by splitting 10 consecutive plants in each plot and counting the number of 5^{th} instar larvae, pupae and/or fresh cavities on 24 September 1999. Counts were subjected to analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05).

No treatments had fewer European corn borers than the untreated control. There were no differences among treatments (Table 1). No phytotoxicity was observed with any treatment.

Field History

Pest:	European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	GH 2547
Planting Date:	9 May 1999
Plant Population:	33,000
Irrigation:	Lockwood sprinkler Senninger 360° nozzles on 18 inch drops
Crop History:	Corn last 3 years
Herbicide:	Basis Gold - 14 oz/acre, Tough - 1.5 pt/acre
Insecticide:	None prior to experiment
Fertilization:	210 N, 91 P, 23 K, 12 S, 8 Zn
Soil Type:	Valentine sandy loam, OM 1.0%, pH 6.5
Location:	Yuma County, NW ¼ Section 1, 2N 53W

Table 1. Control of second generation European corn borer with hand applied RH-2485 2F + Latron CS-7, Dryden Farm, Wray, CO, 1999.

PRODUCT, LB (AI)/ACRE	LARVAE/PLANT ± SEM[1]	% CONTROL
RH-2485 2F, 0.12 + LATRON CS-7	0.7 ± 0.2 A	32
RH-2485 2F, 0.06 + LATRON CS-7	0.8 ± 0.1 A	22
POUNCE 3.2E, 0.15	0.7 ± 0.2 A	27
UNTREATED	1.0 ± 0.4 A	---
F value	0.84	---
p > F	0.5001	---

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

CHEMIGATED AND AERIALLY APPLIED INSECTICIDES FOR CONTROL OF SECOND GENERATION EUROPEAN CORN BORER, DRYDEN FARM, WRAY, CO, 1999

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CHEMIGATED AND AERIALLY APPLIED INSECTICIDES FOR CONTROL OF SECOND GENERATION EUROPEAN CORN BORER, DRYDEN FARM, WRAY, CO, 1999: Chemigation treatments were applied on 13 August 1999 with a Milton Roy - Model B chemigation pump through a Lockwood sprinkler equipped with Senninger 360^o nozzles on 18 inch drops. All insecticides were diluted to the rate of 0.28 gal/acre and applied in 0.3 inch irrigation water per acre. Aerial treatments were applied on 13 August 1999 with a Grumman Ag Cat Model G164A aircraft calibrated to apply 3 and 5 gpa over a 55 ft effective swath through 30 CP nozzles (0.125 orifice size set at 90^o shear at 30 psi and 0.191 orifice size set at 90^o shear at 32 psi, respectively) at an airspeed of 120 mph. Conditions were temperature 62^{o}F, relative humidity 40% and NNE winds at 3-5 mph at the time of treatment. Chemigated plots consisted of 35 acres treated with Capture 2E, 5.12 oz/acre, 14 acres treated with Warrior T, 3.5 oz/acre, 10 acres treated with Warrior T, 3.0 oz/acre and 10 acres untreated. Aerial plots including the untreated zone were eight or more swath widths by the length of the field. All treatments were unreplicated. Crop stage at application was milk.

The accumulation of second generation European corn borer egg masses per plant prior to application was 40%. On the day of treatment 75% of these egg masses were at the blackhead stage or hatched. Live 1st and 2nd instar larvae were found in 5% of the ear tips.

Second generation treatments were evaluated by splitting four groups of 10 consecutive plants per plot and counting the number of 5th instar larvae, pupae and/or fresh cavities per plant on 24 September 1999. Counts from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (á=0.05).

All treatments had fewer European corn borers than the untreated control (Table 1). No phytotoxicity was observed with any treatment.

Field History

Pest:	European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	GH 2547
Planting Date:	9 May 1999
Plant Population:	33,000
Irrigation:	Lockwood sprinkler
	Senninger 360^o nozzles on 18 inch drops
Crop History:	Continuous corn, 3 years
Herbicide:	Basis Gold - 14 oz/acre, Tough - 1.5 pt/acre
Insecticide:	None prior to experiment
Fertilization:	210 N, 91 P, 23 K, 12 S, 8 Zn
Soil Type:	Valentine sandy loam, OM 1.0%, pH 6.5
Location:	Yuma County, NW ¼ Section 1, 2N 53W

Table 1. Chemigated and aerially applied insecticides for control of second generation European corn borer, Dryden Farm, Wray, CO, 1999.

PRODUCT, LB (AI)/ACRE, (delivery)	LARVAE/PLANT[1]	% CONTROL
CAPTURE 2E, 5.12, (chemigated)	0.2 (0.0011)	93
WARRIOR 1T, 3.5, (chemigated)	0.2 (0.0022)	91
WARRIOR 1T, 3.0, (chemigated)	0.4 (0.0011)	80
WARRIOR 1T, 3.5, (aerial)	0.5 (0.0025)	78
WARRIOR 1T, 3.0, (aerial)	0.5 (0.0063)	74
UNTREATED	2.0	---

[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 (á=0.05).

RESIDUAL EFFICACY OF HAND APPLIED INSECTICIDES IN CONTROLLING SECOND GENERATION EUROPEAN CORN BORER, GARDENER FARM, ECKLEY, CO, 1999

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RESIDUAL EFFICACY OF HAND APPLIED INSECTICIDES IN CONTROLLING SECOND GENERATION EUROPEAN CORN BORER, GARDENER FARM, ECKLEY, CO, 1999: Treatments were applied on 19 July, 26 July and 2 August 1999 with a CO_2 powered backpack sprayer calibrated to deliver 17.6 gal/acre at 30 psi through three nozzles (8003 VS TJ, two nozzles were located on 15 inch drops, 34 inches apart, with a single nozzle centered on the main boom.) held at tassel height during the application with all nozzles directed at a single row of plants. Plots were one row by 30 ft separated by a single buffer row and arranged in four replicates of a randomized complete block design. Ten consecutive plants in each plot were artificially infested on 8 and 9 August 1999 using a Davis insect inoculator (“bazooka”) calibrated to place fifty 1st instar larvae one leaf above the ear.

Treatments were evaluated by splitting the ten artificially infested plants per plot and counting the number of 5th instar larvae, pupae and/or fresh cavities on 24 September 1999. Counts were subjected to analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05).

All treatments at all application dates, with the exception of Pounce 3.2EC applied 19 July 1999, had fewer second generation European corn borer larvae than the untreated control (Table 1). No phytotoxicity was observed with any treatment.

Field History

Pest:	European corn borer, *Ostrinia nubilalis* (Hübner)
Cultivar:	Pioneer 34A55
Planting Date:	3 May 1999
Plant Population:	32,000
Irrigation:	Lockwood sprinkler Nelson drops, 360^{o} Rotors
Crop History:	Continuous corn, 3 years
Herbicide:	Balance - 0.94 oz (AI)/acre
Insecticide:	None prior to experiment
Fertilization:	230 N, 45 P, 15 S, 3 K
Soil Type:	Valentine sandy loam, OM 1.0%, pH 6.5
Location:	Yuma County, SW ¼ Section 21, 2N 46W

Table 1. Residual efficacy of hand applied insecticides in controlling second generation European corn borer, Gardener Farm, Eckley, CO, 1999.

PRODUCT, LB (AI)/ACRE	LARVAE/PLANT ± SEM[1]			% CONTROL
	TREATMENT DATES			
	19 July	26 July	2 August	
UNTREATED	2.4 ± 0.3 A	2.4 ± 0.3 A	2.4 ± 0.3 A	---
BAYTHROID 2EC, 0.03	0.3 ± 0.1 B			88
WARRIOR 1T, 0.03	0.3 ± 0.1 B			88
WARRIOR 1T, 0.025	0.5 ± 0.1 B			79
CAPTURE 2EC, 0.08	0.5 ± 0.1 B			79
POUNCE 3.2EC, 0.15	2.0 ± 0.4 A			17
BAYTHROID 2EC, 0.03		0.4 ± 0.1 B		83
WARRIOR 1T, 0.03		0.3 ± 0.1 B		88
WARRIOR 1T, 0.025		0.9 ± 0.4 B		63
CAPTURE 2EC, 0.08		0.4 ± 0.1 B		83
POUNCE 3.2EC, 0.15		0.9 ± 0.2 B		63
BAYTHROID 2EC, 0.03			0.4 ± 0.2 B	83
WARRIOR 1T, 0.03			0.2 ± 0.0 B	92
WARRIOR 1T, 0.025			0.3 ± 0.3 B	88
CAPTURE 2EC, 0.08			0.3 ± 0.2 B	88
POUNCE 3.2EC, 0.15			0.3 ± 0.1 B	88
F Value	14.02	11.26	14.83	---
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 (á=0.05).

CONTROL OF WESTERN BEAN CUTWORM WITH HAND APPLIED RH-2485 2F + LATRON CS-7, BROWN FARM, YUMA, CO, 1999

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CONTROL OF WESTERN BEAN CUTWORM WITH HAND APPLIED RH-2485 2F + LATRON CS-7, BROWN FARM, YUMA, CO, 1999: Treatments were applied on 22 July 1999 with a CO_2 powered backpack sprayer calibrated to deliver 17.6 gal/acre at 30 psi through four 11002VS TeeJet nozzles mounted on a 6 ft boom held at tassel height during the application. Plots were three rows by 30 ft separated by a single buffer row and arranged in four replicates of a randomized complete block design. Crop stage at application was early silk.

At the time of application, 12% of the plants had egg masses and 10% of the egg masses were hatched. Colorado State University research trials have shown that economic injury with western bean cutworm generally occurs when 7% of plants have egg masses and the crop is 95% tasseled. With a plant population of 30,000 this infestation level should result in approximately one larva per ear.

Treatments were evaluated by counting the number of western bean cutworm larvae in the ears of twenty consecutive plants per plot on 19 August 1999. Counts were subjected to analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05).

All treatments had fewer western bean cutworm than the untreated control. There were no differences among treatments (Table 1). Treatments provided excellent control because they were applied before the larvae have entered the ear. No phytotoxicity was observed with any treatment.

Field History

Pest:	Western bean cutworm, *Richia albicosta* (Smith)
Cultivar:	Pioneer ‘34G81' and ‘34G82'
Planting Date:	4 May 1999
Plant Population:	32,500
Irrigation:	Valley sprinkler
Crop History:	Continuous corn, 3 years
Herbicide:	Full time - 3.125 qt/acre
Insecticide:	None prior to experiment
Fertilization:	210 N, 81 P, 47 S, 1.8 Zn
Soil Type:	Deep sand
Location:	Yuma County, NE ¼ Section 34, 1N 47W

Table 1. Control of western bean cutworm with hand applied RH-2485 2F + Latron CS-7, Brown Farm, Yuma, CO, 1999.

PRODUCT, LB (AI)/ACRE	LARVAE/PLANT ± SEM[1]	% CONTROL
RH-2485 2F, 0.06 + LATRON CS-7	0.0 ± 0.0 B	100
RH-2485 2F, 0.12 + LATRON CS-7	0.0 ± 0.0 B	100
POUNCE 3.2E, 0.15	0.0 ± 0.0 B	100
UNTREATED	0.7 ± 0.0 A	---
F value	255.87	---
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 (á=0.05).

CONTROL OF CORN EARWORM WITH AERIALLY APPLIED CAPTURE 2 EC, SMELKER LAND COMPANY, FLAGLER, CO, 1999

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CONTROL OF CORN EARWORM WITH AERIALLY APPLIED CAPTURE 2 EC, SMELKER LAND COMPANY, FLAGLER, CO, 1999: Treatments were applied on 2, 11 and 17 August 1999 with a Weatherley 620 B Aircraft equipped with a Crop Hawk flow meter system with 32 CP nozzles on a 42 ft boom calibrated to apply 3 gal/acre at 25 to 30 psi at an air speed of 115 mph over an effective swath width of 60 ft. Conditions at the time of treatments were wind speed less than 5 mph and relative humidity of 40 to 50%. Plots were six, 60 ft wide swath widths by the length of the field. All treatments were unreplicated.

Corn earworm moth flight was monitored by a pheromone trap located adjacent to the field (Figure 1). Operation of this trap was discontinued on 24 August. Another local pheromone trap site continued to show high numbers of moths through mid-September.

Treatments were evaluated by collecting 10 consecutive ears from six different locations within each treatment on 24 September 1999. The number of larvae and/or vacated larval feeding sites and number of consumed or damaged kernels per larvae per ear were counted. Counts from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (á=0.05).

All treatments had vacant laval feeding sites indicating that eggs were laid and the resulting larvae escaped into the ear prior to the first application (Table 1). The first application was delayed two days due to wind resulting in the application being made at green silk stage which might account for the vacated feeding sites.

Capture 2E, 5.2 oz/acre did not have live larvae at evaluation. Capture 2E, 2.56 oz/acre rates did have live larvae at evaluation with 18% and 12% of the larvae measuring 0 to 1.5 cm in length, 6% to 15% measuring 1.5 to 2.5 cm and 6% and 12% measuring 2.5 to 3.5 cm (Table 1).

All treatments except Capture 2EC, 2.56 oz/acre, applied on 2 and 11 August had fewer corn earworm larvae, kernels lost and damaged ears than the untreated control (Table 2). No phytotoxicity was observed with any treatment.

Field History

Pest:	Corn earworm, *Heliothis zea*
Cultivar:	Pioneer '3514'
Planting Date:	17 May 1999
Plant Population:	32,000
Irrigation:	Sprinkler, Valley
	Drops spray nozzles
Crop History:	Continuous corn, 3 years
Herbicide:	Round-up - pre-plant, Basis Gold - 14oz/acre, Tough - ¾ pt/acre
Insecticide:	Penncap M, 1998
Fertilization:	175 N, 36 P, 23 K
Soil Type:	Loam, OM 1.3%, pH 7.5
Location:	NW ¼, T11S R47W, Kit Carson County

Table 1. Number of corn earworm larvae and their respective measurements in cm as per treatments, Smelker Land Company, Flagler, CO, 1999.

PRODUCT, RATE (OZ/ACRE), APPLICATION DATES	**LARVAL SIZE**			**VACATED FEEDING SITES**
	0-1.5 cm	**1.5-2.5 cm**	**2.5-3.5 cm**	
CAPTURE 2EC, 5.2, 2 AND 11 AUGUST	0 (0%)	0 (0%)	0 (0%)	6 (100%)
CAPTURE 2EC, 5.2, 2 AUGUST	0 (0%)	0 (0%)	0 (0%)	8 (100%)
CAPTURE 2EC, 2.56, 2, 11 AND 17 AUGUST	3 (20%)	1 (7%)	1 (7%)	10 (66%)
CAPTURE 2EC, 2.56, 2 AND 11 AUGUST	3 (12%)	4 (15%)	3 (12%)	16 (61%)
UNTREATED EAST	4 (10%)	7 (16%)	6 (14%)	25 (60%)
UNTREATED WEST	9 (16%)	14 (26%)	4 (7%)	28 (51%)

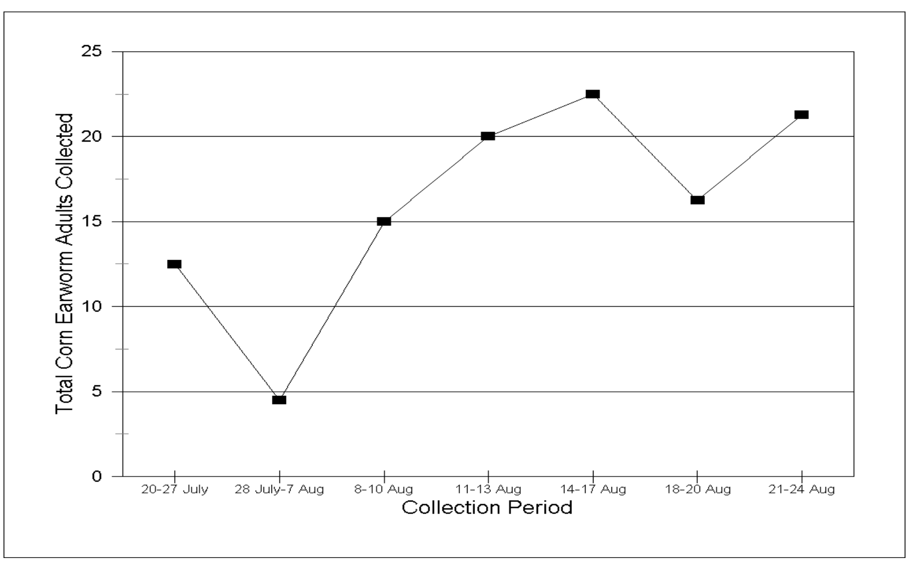
Number in parenthesis indicates percent of total larvae/vacant feeding sites for that treatment.

Table 2. Control of corn earworm with aerially applied Capture 2EC, Smelker Land Company, Flagler, CO, 1999.

PRODUCT, RATE (OZ/ACRE), APPLICATION DATES	**LARVAE/EAR[1,2]**	**KERNELS LOST/EAR[2]**	**# DAMAGED EARS/10 EARS[2]**
CAPTURE 2EC, 5.2, 2 AND 11 AUGUST	0.1 (0.0006)	2.0 (0.0032)	1.0 (< 0.0001)
CAPTURE 2EC, 5.2, 2 AUGUST	0.1 (0.0003)	3.1 (0.0014)	1.3 (< 0.0001)
CAPTURE 2EC, 2.56, 2, 11 AND 17 AUGUST	0.3 (0.0028)	3.1 (0.0026)	2.5 (0.0010)
CAPTURE 2EC, 2.56, 2 AND 11 AUGUST	0.5 (0.0379)	11.1 (0.1516)	4.7 (0.0651)
UNTREATED	0.9	18.0	7.3

[1]Includes both live larvae and vacated feeding sites.
[2]Number in parenthesis indicates probability of mean being similar to the untreated control, calculated with a two-tailed t-test with assumed equal variance (á=0.05).

Figure 1. Corn earworm pheromone trap moth flight samples, Smelker Land Company, Flagler, CO, 1999.



CONTROL OF BANKS GRASS MITE AND WESTERN CORN ROOTWORM ADULTS WITH AERIALLY APPLIED INSECTICIDES IN 1998 AND WESTERN CORN ROOTWORM LARVAL CONTROL IN 1999, CODY FARM, BURLINGTON, CO, 1999

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CONTROL OF BANKS GRASS MITE AND WESTERN CORN ROOTWORM ADULTS WITH AERIALLY APPLIED INSECTICIDES IN 1998 AND WESTERN CORN ROOTWORM LARVAL CONTROL IN 1999, CODY FARM, BURLINGTON, CO, 1999: Capture 2E and Capture 2E plus dimethoate were applied on 24 July 1998 with an AgCat Model C aircraft equipped with 36 CP nozzles (deflector set at 30 degrees) calibrated to apply 3 gal/acre at an airspeed of 135 mph over an effective swath width of 65 ft. Conditions at the time of treatment were wind speed less than 5 mph, temperature of 82EF and 40% relative humidity. The Penncap M treatment was applied on 18 August 1998 with a Weatherly aircraft equipped with 23 CP nozzles (deflector set at 30 degrees) calibrated to apply 2 gal/acre at an airspeed of 125 mph over an effective swath width of 55 ft. Conditions at the time of treatment were wind speed less than 5 mph, a temperature of 80EF and 35% relative humidity. Plots were unreplicated and consisted of 86 rows untreated, 130 rows of Capture 2E, 86 rows of Capture 2E plus dimethoate with the balance of the field Capture 2E plus dimethoate with a second application of Penncap M. Crop stage at application was silk.

Treatments were evaluated for western corn rootworm adults by counting the number of beetles per plant on three groups of 10 consecutive plants prior to treatment on 21 July 1998 and post treatment on 4, 11 and 17 August 1998. Precounts averaged 4.0 beetles per plant with 4% gravid females. On 28 July 1998, 12-15% of the females were gravid. The second application of Penncap M was made based on the beetle population exceeding the economic threshold of 0.4 beetles per plant, due to immigration and extended beetle emergence. Beetle counts from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (á=0.05).

Treatments were evaluated for western corn rootworm larval damage by digging six groups of three consecutive plants on 12 July 1999 in the exact location where beetle counts were made in 1998. 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 from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (á=0.05).

Treatments were evaluated for Banks grass mite by counting the number of leaves expressing mite feeding symptoms (chlorotic areas) on three groups of 10 consecutive plants on 4, 11 and 17 August 1998. Leaf counts from treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (á=0.05).

Yield was determined by harvesting eight-660 ft rows in the untreated control and eight-1830 ft rows in the Capture 2E plus dimethoate. Moisture and test weight were determined and yields converted to bu/acre adjusted to 15% moisture.

All treatments had less western corn rootworm larval damage than the untreated control (Table 2). No phytotoxicity was observed with any treatment.

Field History

Pest:	Banks grass mite, *Oligonychus pratensis* (Banks) Western corn rootworm, *Diabrotica virgifera virgifera* (LeConte)
Cultivar:	Pioneer 34K 77 (1998);
Planting Date:	21 April 1998
Plant Population:	32,000 (1998)
Irrigation:	Sprinkler
Crop History:	Continuous corn, 10 years
Herbicide:	Marksman, 2 pt/acre (1998)
Insecticide:	None prior to experiment
Fertilization:	210 N, 25 P, 0 K, 5 S, 0.5 Zn (1998)
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	CAPTURE 2E, 0.08 + DIMETHOATE, 0.50	UNTREATED
MITE INFESTED AND/OR CHLOROTIC LEAVES	4 August	4.4	4.2	7.0
	11 August	3.5	3.8	8.5
	17 August	4.8	4.0	11.6
BEETLES PER PLANT	4 August	0.7	0.2	4.8
	11 August	0.8	0.4	4.7
	17 August	2.9	1.2	4.0
YIELD (BU/ACRE @ 15% MOISTURE)		220.3	---	214

Table 2. Control of Banks grass mite and western corn rootworm adults with aerially applied insecticides in 1998 and western corn rootworm larval control in 1999, Cody Farm, Burlington, CO, 1999.

PRODUCT, LB (AI)/ACRE	ROOT RATING[1]
CAPTURE 2EC + DIMETHOATE 4E + PENNCAP M, 0.08 + 0.5 + 0.1875	2.6 (< 0.0001)
CAPTURE 2EC + DIMETHOATE 4E, 0.08 + 0.5	3.7 (< 0.0001)
CAPTURE 2EC, 0.08	3.8 (< 0.0001)
UNTREATED	6.0

[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 (á=0.05).

CONTROL OF CORN SPIDER MITES WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1999

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

CONTROL OF CORN SPIDER MITES WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 1999: Early treatments (Table 1) were applied on 25 July 1999 using a 2 row boom sprayer mounted on a backpack calibrated to deliver 17.8 gal/acre at 32 psi with two 8002VS drop nozzles per row. Conditions were clear with calm winds and air temperature of 78EF. All other treatments were applied on 29 July 1999 with the same sprayer. Conditions were partly cloudy with calm winds and air temperature of 74EF. Plots were 25 ft by two rows (30 inch centers) and were arranged in four replicates of a randomized complete block design. Plots were separated from neighboring plots by a single buffer row. Plots were infested on 6 July 1999 by laying mite infested corn leaves, which had been collected that morning in Fruita, CO, across the corn plants on which mites were to be counted. On 9 July 1999, the experimental area was treated with Pounce, 0.2 lb(AI)/acre to control beneficial insects and to encourage buildup of spider mite densities.

Treatments 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 9 August 1999 (0=15 mites per leaf) for all treatments. Mite counts and mite days (calculated by the method of Ruppel, J. Econ. Entomol. 76: 375-377) were transformed by the square root + ½ method prior to analysis of variance and means separation by the Student-Neuman-Keul method (á=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 the table.

Mite densities were moderate and highly variable. Capture 2E + dimethoate 4E, Furadan 4F + dimethoate 4E and Capture 2E treatments had fewer mites than the untreated control at 1, 2 and 3 weeks after treatment. Capture 2E + dimethoate 4E, Furadan 4F + dimethoate 4E, Capture 2E and Comite II 6E + dimethoate 4E had fewer mite days than the untreated control. No phytotoxicity was observed with any treatment.

Field History

Pest:	Banks grass mite, *Oligonychus pratensis* (Banks)
Cultivar:	Pioneer ‘3893'
Planting Date:	12 May 1999
Plant Population:	28,000
Irrigation:	Linear move sprinkler with drop nozzles
Crop History:	Continuous corn 8 years
Herbicide:	Landmaster, 54 oz on 13 May 1999, 2.2 lbs(AI)/acre Aatrex-Nine-O and 0.5 pt/acre Hi-Dep on 8 June 1999
Insecticide:	Pounce 3.2EC at 0.2 lbs(AI)/acre on 9 July 1998
Fertilization:	150 N, 80 P_2O_5
Soil Type:	Sandy clay loam, OM 1.6%, pH 7.8
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (north side of Block 1080)

Table 1. Control of corn spider mites with hand-applied insecticides, ARDEC, Fort Collins, CO, 1999.

	MITES PER 3 LEAVES ± SEM[1]				
PRODUCT, LB (AI)/ACRE	**1 WEEK**	**2 WEEKS**	**3 WEEKS**	**TOTAL MITE DAYS**	**% REDUCTION[2]**
CAPTURE 2E + DIMETHOATE 4E, 0.08 + 0.50	60.9 ± 31.5 CD	134.2 ± 46.8 C	188.2 ± 58.0 E	2539.4 ± 853.7 D	82
FURADAN 4F + DIMETHOATE 4E, 1.00 + 0.50	50.6 ± 33.9 D	176.5 ± 92.0 C	195.5 ± 45.8 E	2616.6 ± 1115.5 D	82
CAPTURE 2E 0.08	53.8 ± 23.5 CD	214.8 ± 89.4 BC	331.7 ± 95.0 CDE	3327.2 ± 1035.2 CD	77
COMITE II 6E + DIMETHOATE 4E, 1.69 + 0.50	86.6 ± 47.1 BCD	318.8 ± 120.9 ABC	327.9 ± 143.8 DE	4275.3 ± 1279.1 BCD	70
DIMETHOATE 4E, 0.50	84.6 ± 34.3 ABCD	455.1 ± 230.5 ABC	466.7 ± 124.4 ABCDE	5537.3 ± 1649.4 ABCD	61
COMITE II 6E, 2.53	144.3 ± 15.2 ABCD	857.3 ± 351.4 AB	357.4 ± 42.5 BCDE	8721.8 ± 2659.7 ABC	38
F8086 0.85E, 0.3	171.2 ± 28.3 ABC	758.8 ± 242.9 AB	810.9 ± 220.8 AB	9231.1 ± 1446.2 AB	35
FURADAN 4F, 1.00	118.4 ± 36.8 ABCD	894.9 ± 368.3 AB	651.3 ± 147.4 ABCD	9601.2 ± 3158.8 AB	32
F8080 0.85E, 0.3	186.5 ± 30.0 ABC	958.3 ± 390.4 AB	629.1 ± 88.2 ABCD	10313.1 ± 2974.2 AB	27
TD-2383 5L (cyhexatin), 0.75 (early)	238.0 ± 31.2 A	810.3 ± 172.0 AB	864.5 ± 224.0 AB	10340.7 ± 1408.2 AB	20
PENNCAP M 2FM, 0.75	163.6 ± 30.6 ABC	1019.8 ± 310.9 A	1000.3 ± 308.0 A	11519.3 ± 2230.6 A	19
TD-2383 5L (cyhexatin), 1.00	218.1 ± 30.7 AB	1061.6 ± 336.5 A	870.7 ± 286.1 AB	12024.9 ± 2189.2 A	15
TD-2383 5L (cyhexatin), 0.75	181.3 ± 36.4 ABC	1273.2 ± 501.1 A	817.6 ± 267.6 AB	12867.1 ± 3604.4 A	9
COMITE II 6E, 1.69 (early)	195.5 ± 36.3 AB	1184.0 ± 427.5 A	794.2 ± 172.4 AB	12280.7 ± 2821.4 A	8
F8086 0.85E, 0.1	212.7 ± 52.4 AB	1360.8 ± 592.3 A	730.8 ± 288.5 ABCD	13735.0 ± 4468.8 A	3
TD-2383 5L (cyhexatin), 1.00 (early)	219.0 ± 39.1 AB	1230.3 ± 507.7 A	720.2 ± 128.7 ABC	12771.0 ± 3359.9 A	3
UNTREATED	236.6 ± 23.2 A	1210.3 ± 553.7 A	833.4 ± 228.2 AB	13101.2 ± 4058.9 A	---
F8080 0.85E, 0.1	261.1 ± 67.8 A	1319.8 ± 586.9 A	784.9 ± 162.3 AB	14274.8 ± 4562.8 A	-1
F Value	5.19	8.91	10.82	8.34	
p > F	< 0.0001	< 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 (á=0.05).
[2]Percent reduction in total mite days, calculated by the Ruppel method.

CONTROL OF SPOTTED SUNFLOWER STEM WEEVIL WITH PLANTING AND CULTIVATION TREATMENTS, CENTRAL GREAT PLAINS RESEARCH STATION, AKRON, CO, 1999

Stan Pilcher, Dave Kennedy, Barney Filla, Golden Plains Cooperative Extension; Mike Koch, Central Great Plains Research Station, Colorado State University; Shawn Walter, Department of Bioagricultural Sciences and Pest Management, Colorado State University

CONTROL OF SPOTTED SUNFLOWER STEM WEEVIL WITH PLANTING AND CULTIVATION TREATMENTS, CENTRAL GREAT PLAINS RESEARCH STATION, AKRON, CO, 1999: Planting time treatment was applied on 19 May 1999 with a John Deere Maxi-Merge planter equipped with a CO_2 powered micro-tube directed into the seed furrow ½ inch above the seed. Cultivation treatments were applied on 2 July 1999 in a 12 inch band with a CO_2 powered sprayer with an over-whorl nozzle (8003 VS-TJ) positioned 6 inches above the whorl mounted on an Orthman cultivator. Plots were one row by 50 ft separated by a single buffer row and arranged in four replicates of a randomized complete block design. Crop stage at cultivation application was V6 to V8. Spotted stem weevil densities at cultivation averaged one adult per two plants.

Treatments were evaluated on 2 September by dissecting 5 plants per plot and counting the number of sunflower stem weevil larvae in the lowest 18 inches of stalk. Counts were subjected to analysis of variance and mean separation by the Student-Neuman-Keul test (á=0.05).

All treatments had fewer spotted sunflower stem weevil than the untreated control. Planting and cultivation Furadan 4F, 1.0 lb(AI)/acre treatments had fewer stem weevils than all other treatments (Table 1). No phytotoxicity was observed with any treatment.

The economic injury level for sunflower stem weevil based on number of larvae per plant is unclear but may be affected by stalk diameter and Phoma Black Stem rot. Phoma Black Stem rot was noted in this study at low levels, primarily in the untreated control.

Field History

Pest:	Sunflower stem weevil, *Cylindrocopturus adspersus* (LeConte)
Cultivar:	Cargill 187
Planting Date:	19 May 1999
Plant Population:	18,000
Irrigation:	None
Crop History:	Wheat 1998
Insecticide:	None prior to experiment
Herbicide:	Spartan 0.135 oz(AI)/acre
Fertilization:	40 N
Soil Type:	Weld Silt Loam and Platner Loam, OM 1%, pH 7.0
Location:	USDA Central Great Plains Research Station, Akron, CO.

Table 1. Control of spotted sunflower stem weevil with planting and cultivation timed treatments, Central Great Plains Research Station, Akron, CO, 1999.

PRODUCT, LB(AI)/ACRE	TIMING	LARVAE/PLANT ± SEM[1]	% CONTROL	% LODGING
FURADAN 4F, 1.0	CULTIVATION	1.0 ± 0.3 D	95	3.0
FURADAN 4F, 1.0	PLANTING	1.2 ± 0.3 D	94	2.2
WARRIOR 1E, 0.03	CULTIVATION	5.2 ± 0.8 C	72	8.0
WARRIOR 1E, 0.02	CULTIVATION	5.7 ± 1.1 C	69	7.8
BAYTHROID 2E, 0.03	CULTIVATION	5.8 ± 1.0 C	69	7.2
MUSTANG 1.5E, 0.045	CULTIVATION	6.1 ± 0.8 C	66	9.6
BAYTHROID 2E, 0.02	CULTIVATION	7.3 ± 0.9 BC	60	11.4
FURADAN 4F, 0.75	CULTIVATION	10.0 ± 0.4 B	45	13.2
MUSTANG 1.5E, 0.03	CULTIVATION	10.2 ± 1.6 B	44	15.6
UNTREATED		18.2 ± 0.7 A	---	26.8
F value		30.615		
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 (á=0.05).

THE 1999 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 year's Golden Plains Pest Survey Program was coordinated by Barney Filla, Soil and Crop Sciences student attending 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 pest survey a success:

1999 Light Trap Operators		**1999 Pest Survey Committee**	
Bonny Dam	Bill Cody Jr. and Family	Allan Brax	Mike Fecht
Burlington	Stratton Equity COOP	Bill Brown	Merlin Van Deraa
Eckley	Merle and Hazel Gardner	Frank Peairs	Mike Ferrari
Holyoke	Scott Korte	John Person	Bill Cody
Kirk	Gene Nelson	Dave Green	Ron Meyer
Wauneta	Clark Lenz	Gene Kleve	Randy Haarberg
Wray	Gleason Dryden	Stan Pilcher	John Kreidler
Yuma	Irrigated Research Farm	Jack Rhodes	Todd Frank

Contributors to the 1999 Golden Plains Pest Survey Program

Akron: Birdsall Young,Jr., Lyle A. Foutz, Earl Jesse, Glenn Baker, Robert L. Schenk, Vale Blessing, John Hickert, Rob Pachner, Charles Callahan, John Wright, Arnold Page (Akron Flying Service Inc.).

Anton: Chester Kenney (Anton Co-op Assn.), Newell A. Herron.

Arapahoe: Pat Hornung.

Arriba: Darrel Lehrkamp (Tri-Me Spraying Service).

Atwood: Kevin Blome (Agrevo USA Co.) .

Aurora: Todd Frazier (American Cyanamid), Cris Wagner (American Cyanamid).

Benkelman, NE: Doran Jessee (D & D Jessee Farm, Inc.).

Bethune: Ken Hildebrandt (Warrior Aviation), Jack Lowe.

Brush: David Wagers.

Burlington: Dan Slinger (Stratton Equity Coop), Schutte Farms, Louis Nider (Nider Farms), Bill D. Hinkhouse, Dale Hansen, Larry Feldhousen, Gerald Cody, William Cody, Kane Cody, Jeff Nitsch (Servi-Tech), Berry Hinkhouse, Carlyle James (C & C James Ranch, Inc.), John Mauch (Wilcox Oil & Chemical, Inc.), Clayton Smith.

Bushnell, NE: Bill Booker (Mycogen Seeds).

Colby, KS: Chad Fabrizius (American Cyanamid), Darren Rubottom (American Cyanamid).

Cope: Ed Cecil (Cecil Ranch), Sackett's Inc.

Des Moines, IA: Asgrow Seed Co.

Eckley: Ted Tuell (Tuelland Inc.), Max Schafer, Merle & Hazel Gardner (Spittoon Ranch).

Elsie, NE: Don Langmacher, Dick Leonard.

Enders, NE: Terry Bilka.

Flagler: Leroy Loutzenhiser, Dallas Saffer (Flagler Aerial Spraying Inc), E. Leroy Loutzenhiser (LKF Partnership), Rex Loutzenhiser.

Fleming: Jim Atkin (Atkin Seeds).

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Fort Morgan: Tim Carpenter (Centennial Ag Supply), Leland Brockman (Novartis Crop Protection),James O"Bannon (Helena Chemical) .

Gering, NE: Tim Wolf.

Goodland, KS: Bill Shields (Pueblo Chemical & Supply CO.).

Grand Junction: Grand Valley Hybrids, Inc

Grant, NE: Mark McGreer, Clinton Fuchs (Golden Harvest).

Greeley:	Calvin Nolke (Bayer,Inc.), Tom Farris (Pueblo Chemical & Supply Co.), Bob Leisy (Asgrow), James E, Anderson (Bayer, Inc), Calvin Heimbauch, Bob Zellmer (Colorado Farm Network), Bill Curran.
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Idalia:	Larry Allen (Allen Grain).
Imperial, NE:	Rod Johnson (R-Nette Inc), David Kempks (Southwest Scouting Service).
Indianola, NE:	Stan Stockhaus (Mycogen Seeds).
Joes:	Elden Hill, Randy Haarberg (Haarberg Consulting, Inc.), Kenneth Schneider, Richard Schneider (Schneider Farms Inc,).
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Kearney, NE:	Ted Warfield (FMC Corporation).
Kirk:	Darrell Idler (Idler Brothers), James Idler (Idler Brothers), Eugene Nelson (Frank & Nelson), Ervin Frank (Frank Farms), Todd Frank (Frank & Nelson), Kent Ficken, Lesley C. Lewis.
Limon:	Don Wardlaw (American Cyanamid).
Lincoln, NE:	Pioneer Hi-Bred International Inc.
Lodgepole, NE:	Mike Behrends.
Longmont:	Lyle Fagala (Zeneca Ag Products), Paul Joe Ogg (American Cyanamid CO), Warren Smith (Mycogen Seeds).
Loveland:	John Person (FMC), Claude Ross (FMC), Scott Inman (Elf Atochem No. America, Inc.) Paul H Koehler (Garst Seed CO), Ken Schwalm (Grand Valley Hybrids).
McDonald, KS:	C. W. Antholz
Monument:	John T. Doyle (Rhone Poulenc)
North Platte, NE:	Mike Sughroue (American Cyanamid), Corby Jensen (Monsanto Globle Seed Group), Jerry Nelson (American Cyanamid).
Ogallala, NE:	David DeVries (Platte Valley Crop Consulting), Allan Brax, Guy Jones.
Otis:	Steve Perry, Ken Kuntz, Ken Melendy, Richard Lewton (Lewton Farms), Harlan & Donita Schaffert.
Ovid:	Rick Haynes.

Sterling: Darrel W. Mertens (Aero Applicators, Inc.), Frank Molinaro (Ag. Crop Services).

Stratton: Timothy & Gary Pautler, Mike Livingston, Stratton Equity Co-op.

Torrington, WY: Steven Nighswonger (American Cyanamid).

Vernon: Duaine & Wanda Dodsworth.

Woodrow: Arven Vondy (Vondy Ranch).

Wray: Lance Russell (Asgrow), Dick Yearous (Simplot Soilbuilders), KRDZ, Jim Soehner, Dennis Atwell, Dwight and Nancy Rockwell, Alan Welp (Welp Farms), Marc Cartwright (Servi-Tech), Jim Bowman, Dave Wilson (Stalk, Inc), Durad and Darus Fix (D&D Farms), John Kreidler (Ag Aviation, Inc.), Robert L. Sitzman (Slash Diamond Farms, LLC), Daryl Monasmith, Larry Gardner (Covenant Farms), Kyle Domsh, Eldon and Sue Dryden, Gleason Dryden, Will Moyer (Centennial Ag Supply Co.), Phil Osmus, Greg Skoglund (Ag Aviation, Inc.).

York, NE: Maynard Ochs (Mycogen Seeds).

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SUMMARY OF 1999 SUCTION, LIGHT AND PHEROMONE TRAP CATCHES

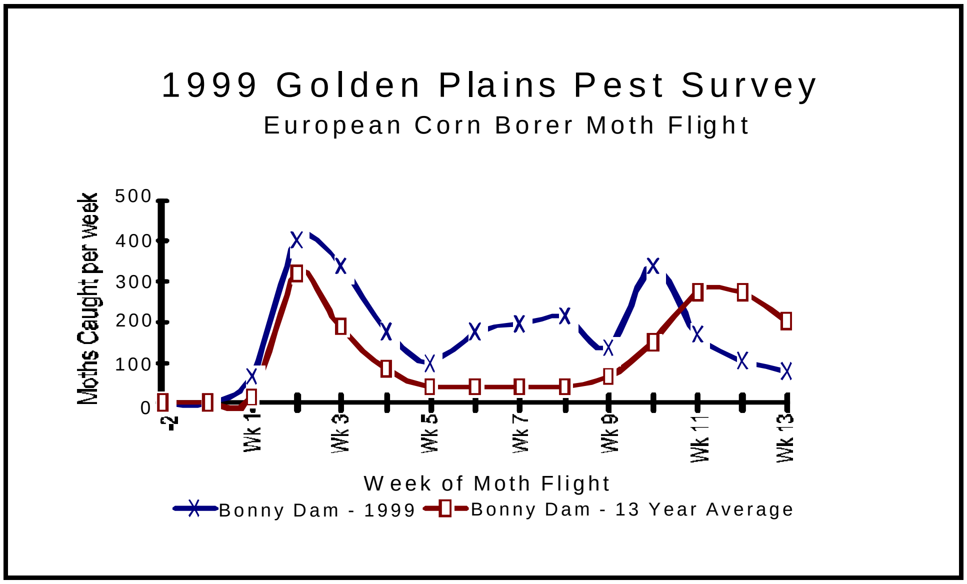
The following graphs compare the 1999 European corn borer moth flight with the average moth flight (including 1999) by geographic location. Geographic location is defined as a 10 square mile area. The number of years that contributed to the average ranges between 2 and 12. This historic information depicts the significance of a singular year. It also depicts locations where first and second generation are clearly defined with little moth flight in between the major flights and locations where moth flights occurred and continued between the major flights. It also depicts where flights extend late after the peak on second generation. Where the continued moth flight occurs and the extended moth flight occurs, insecticidal control attempts often result in lower than expected control.

First generation European corn borer moth flight numbers were less than average this year (Bonny Dam was the exception). This was partially due to extreme climatic factors during June that reduced light trap catches. Moth flight activity (200 or more moths/night) was noted at Wray, Bonny Dam, Kirk and Wauneta. Second generation European corn borer moth flight was greater at Wray, Holyoke, Bonny Dam, Kirk and Wauneta.

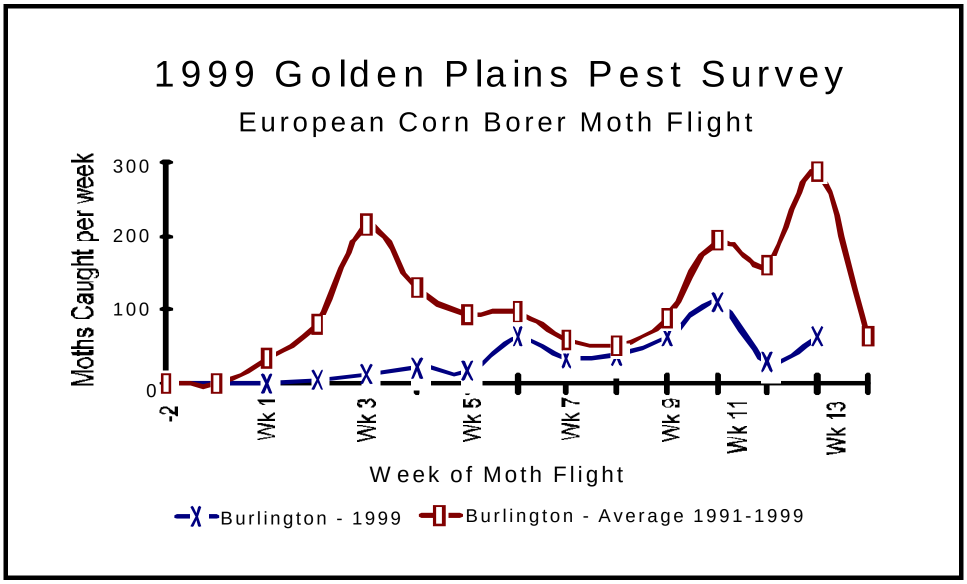
Western bean cutworm were average for most traps with the exception of Wauneta which was extremely high.

Corn earworm moth flights were monitored with pheromone traps at Bethune, Haxtun, Flagler and Otis.

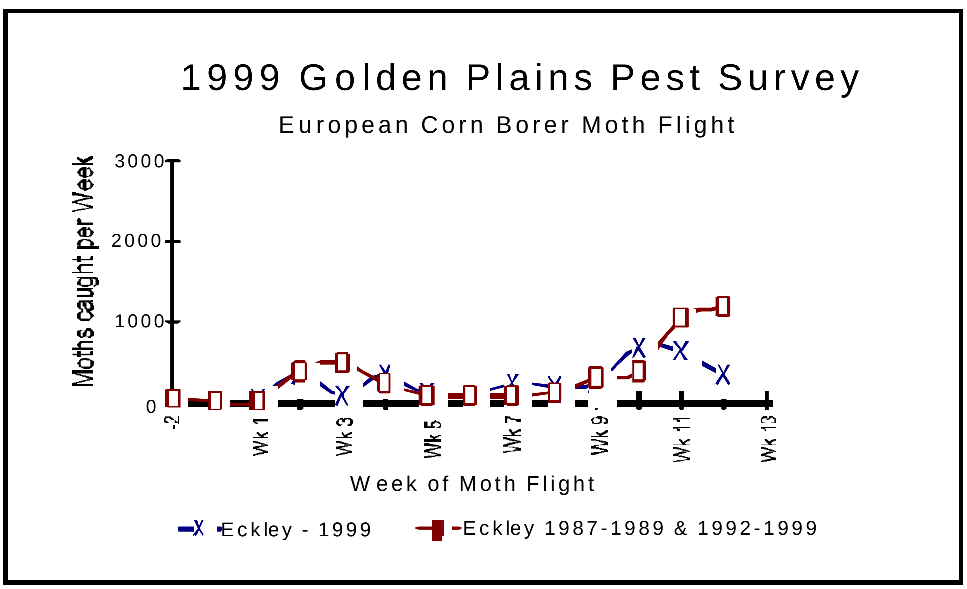
Note that the axis scale changes from graph to graph (number of moths).



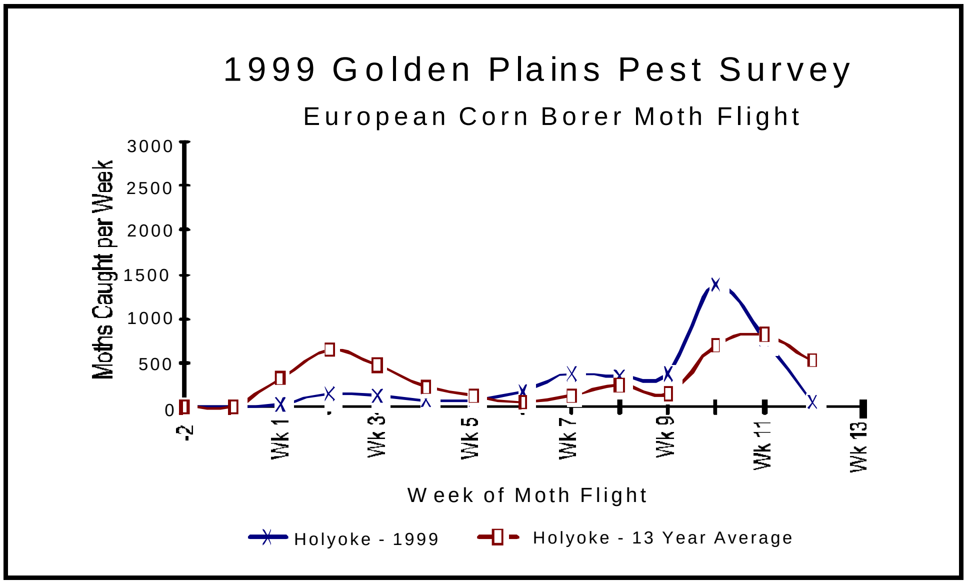
1999 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per week
500
400
300
200
100
0
-2
Wk 1
Wk 3
Wk 5
Wk 7
Wk 9
Wk 11
Wk 13
Week of Moth Flight
Bonny Dam - 1999
Bonny Dam - 13 Year Average

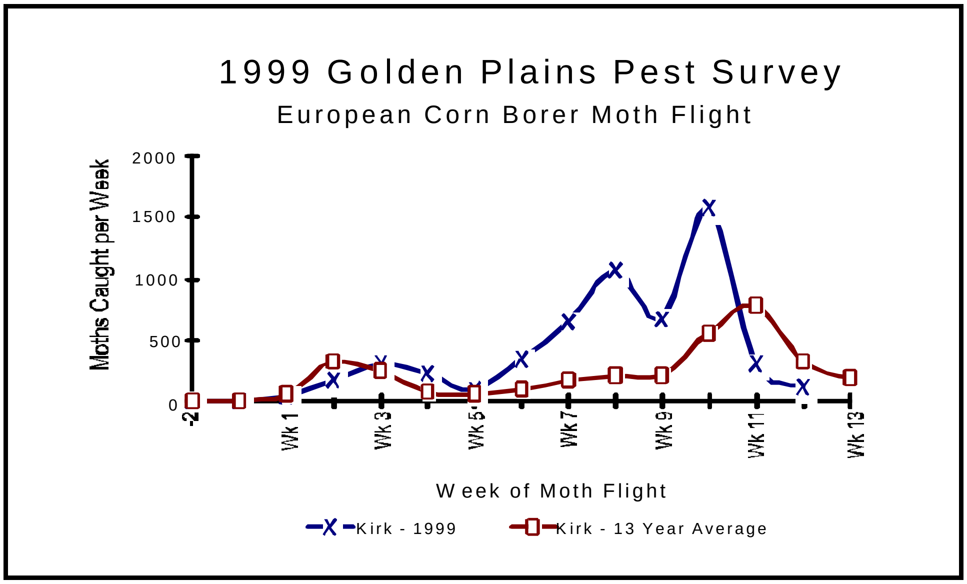


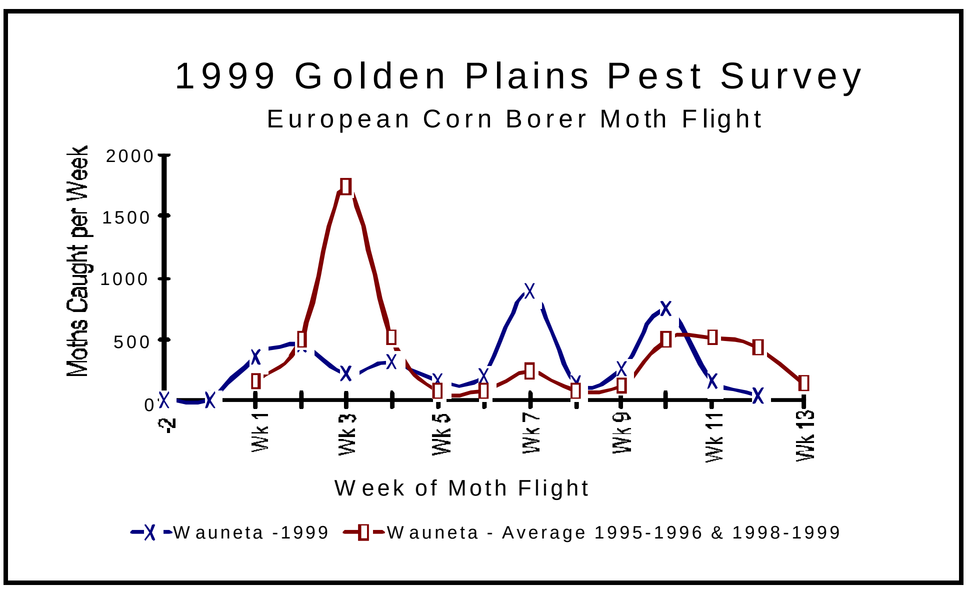
1999 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per week
300
200
100
0
-2
Wk 1
Wk 3
Wk 5
Wk 7
Wk 9
Wk 11
Wk 13
Week of Moth Flight
Burlington - 1999
Burlington - Average 1991-1999

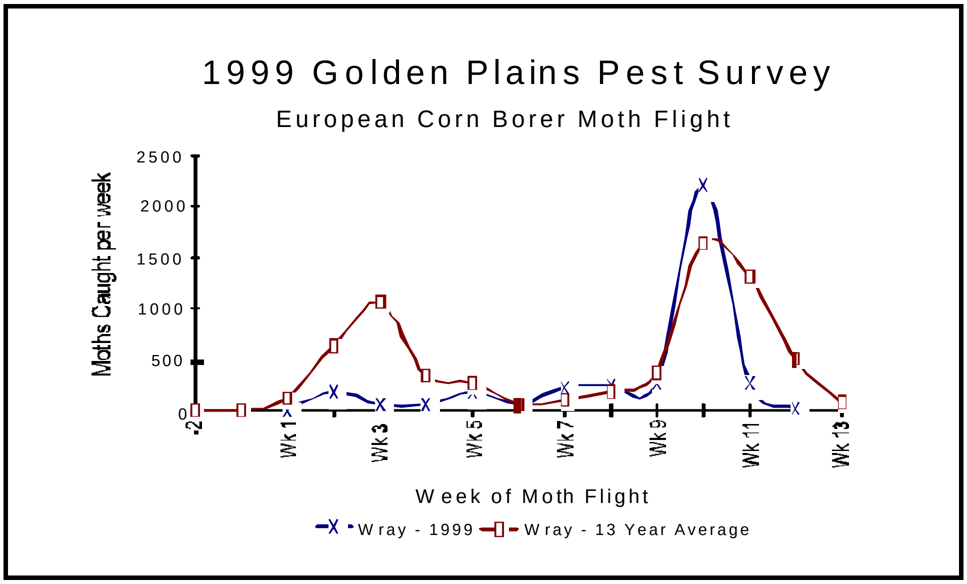


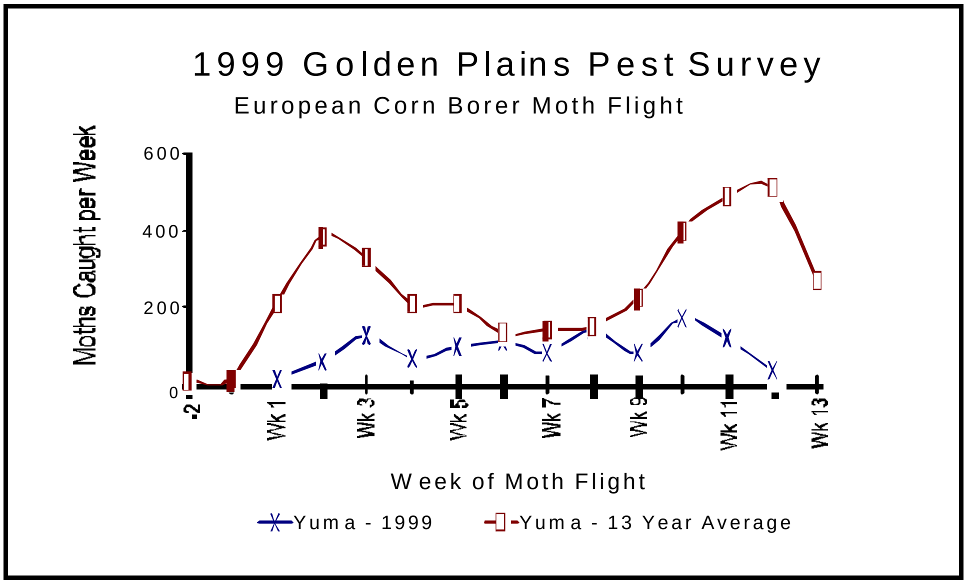
1999 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths caught per Week
3000
2000
1000
0
-2
Wk 1
Wk 3
Wk 5
Wk 7
Wk 9
Wk 11
Wk 13
Week of Moth Flight
Eckley - 1999
Eckley 1987-1989 & 1992-1999

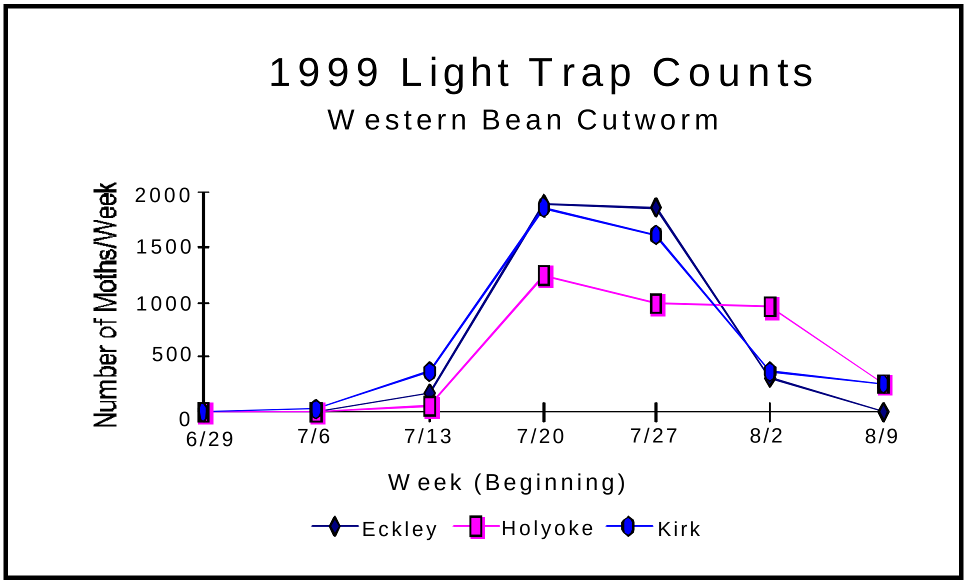

1999 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
3000
2500
2000
1500
1000
500
0
-2
Wk 1
Wk 3
Wk 5
Wk 7
Wk 9
Wk 11
Wk 13
Week of Moth Flight
Holyoke - 1999
Holyoke - 13 Year Average

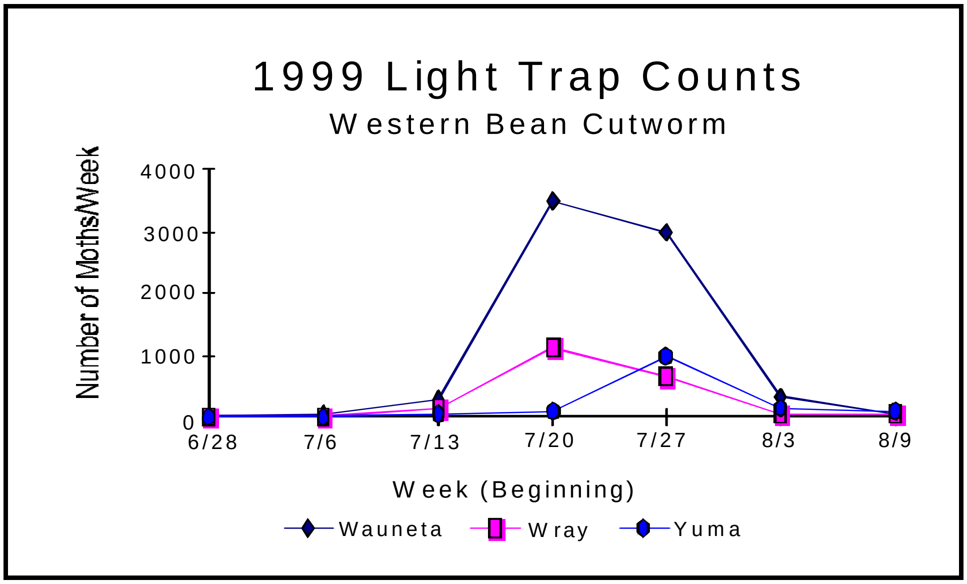

1999 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
2000
1500
1000
500
0
-2
Wk 1
Wk 3
Wk 5
Wk 7
Wk 9
Wk 11
Wk 13
Week of Moth Flight
Kirk - 1999
Kirk - 13 Year Average

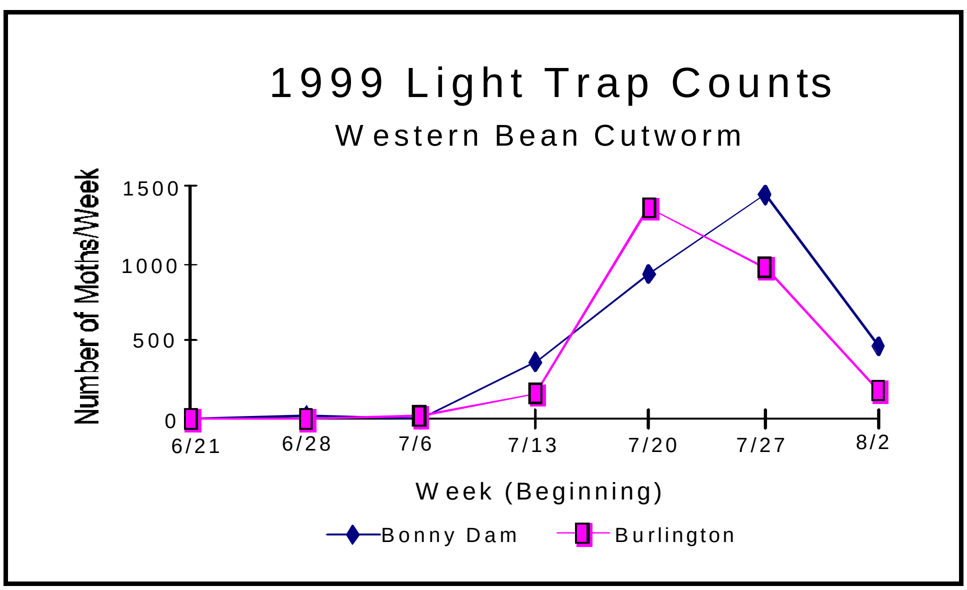

1999 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
2000
1500
1000
500
0
-2
Wk 1
Wk 3
Wk 5
Wk 7
Wk 9
Wk 11
Wk 13
Week of Moth Flight
Wauneta -1999
Wauneta - Average 1995-1996 & 1998-1999

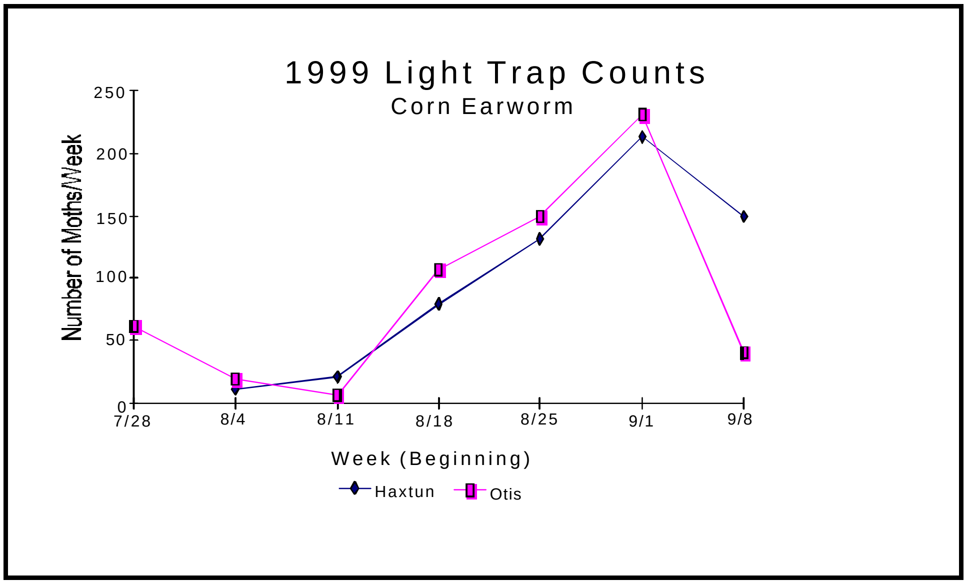

1999 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per week
2500
2000
1500
1000
500
0
-2
Wk 1
Wk 3
Wk 5
Wk 7
Wk 9
Wk 11
Wk 13
Week of Moth Flight
Wray - 1999
Wray - 13 Year Average


1999 Golden Plains Pest Survey
European Corn Borer Moth Flight
Moths Caught per Week
600
400
200
0
-2
Wk 1
Wk 3
Wk 5
Wk 7
Wk 9
Wk 11
Wk 13
Week of Moth Flight
Yuma - 1999
Yuma - 13 Year Average


1999 Light Trap Counts
Western Bean Cutworm
Number of Moths/Week
2000
1500
1000
500
0
6/29
7/6
7/13
7/20
7/27
8/2
8/9
Week (Beginning)
Eckley
Holyoke
Kirk


1999 Light Trap Counts
Western Bean Cutworm
Number of Moths/Week
4000
3000
2000
1000
0
6/28
7/6
7/13
7/20
7/27
8/3
8/9
Week (Beginning)
Wauneta
Wray
Yuma


1999 Light Trap Counts
Western Bean Cutworm
Number of Moths/Week
1500
1000
500
0
6/21
6/28
7/6
7/13
7/20
7/27
8/2
Week (Beginning)
Bonny Dam
Burlington


1999 Light Trap Counts
Corn Earworm
Number of Moths/Week
250
200
150
100
50
0
7/28
8/4
8/11
8/18
8/25
9/1
9/8
Week (Beginning)
Haxtun
Otis

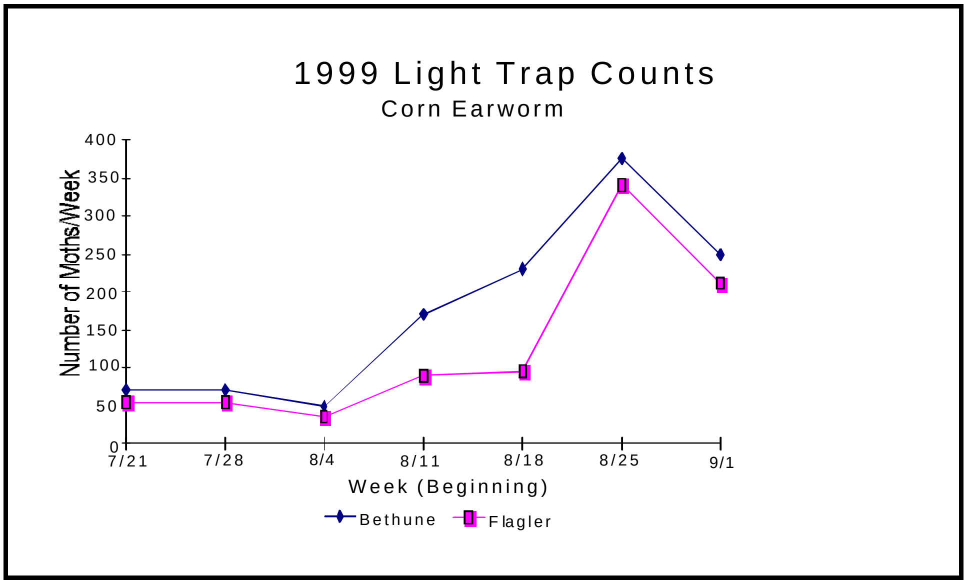

1999 Light Trap Counts
Corn Earworm
Number of Moths/Week
400
350
300
250
200
150
100
50
0
7/21
7/28
8/4
8/11
8/18
8/25
9/1
Week (Beginning)
Bethune
Flagler

Table 1. Russian wheat aphid suction trap results at four Colorado locations, 1987-1999.

	AKRON	BRIGGSDALE[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
1999	1257	573	508	257

[1]Trap moved to ARDEC (Agricultural Research, Development and Education Center, Colorado State University, Fort Collins, CO) from Briggsdale in 1990. Trap moved back to Briggsdale in 1999.

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 1999.

Table 1. Performance of planting-time insecticides against western corn rootworm, 1987-1999, in northern Colorado

INSECTICIDE	IOWA 1-6 ROOT RATING[1]
AZTEC 2.1G	2.6 (20)
COUNTER 15G	2.6 (25)
COUNTER 20CR	2.5 (33)
DYFONATE 20G	2.8 (12)
FORCE 1.5G (8 OZ) or 3G (4 OZ)	2.7 (23)
FORTRESS 5G	2.8 (14)
LORSBAN 15G	3.1 (17)
THIMET 20G	3.4 (15)
UNTREATED CONTROL	4.2 (23)

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

Table 2. Performance of cultivation insecticide treatments against western corn rootworm, 1987-1999, in northern Colorado.

INSECTICIDE	IOWA 1-6 ROOT RATING[1]
COUNTER 15G	2.7 (15)
DYFONATE 20G	3.1 (9)
FORCE 1.5G or 3G	3.2 (7)
FURADAN 4F, 2.4 OZ, BANDED OVER WHORL	3.2 (12)
FURADAN 4F, 1.0, INCORPORATED	3.3 (3)
LORSBAN 15G	3.2 (11)
THIMET 20G	2.9 (15)
UNTREATED CONTROL	4.4 (19)

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

Table 3. Insecticide performance against first generation European corn borer, 1982-1999, in northeast Colorado.

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

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

Table 4. Insecticide performance against western bean cutworm, 1982-1999, in northeast Colorado.

MATERIAL	LB (AI)/ACRE	METHOD[1]	% CONTROL[2]
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)

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

Table 5. Insecticide performance against second generation European corn borer, 1982-1999, in northeast Colorado.

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

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

Table 6. Performance of hand-applied insecticides against alfalfa weevil larvae, 1984-1999, in northern Colorado.

PRODUCT	RATE	% CONTROL AT 2 WK[1]
BAYTHROID 2E	0.025	97 (6)
FURADAN 4F	0.25	86 (10)
FURADAN 4F	0.50	92 (18)
LORSBAN 4E	0.75	94 (13)
LORSBAN 4E	1.00	96 (6)
LORSBAN 4E	0.50	83 (10)
PENNCAP M	0.75	86 (10)
PERMETHRIN [2]	0.10	67 (7)
PERMETHRIN [2]	0.20	80 (4)
WARRIOR 1E	0.02	98 (10)

[1]Number in () indicates number of years included in average.
[2]Includes both Ambush 2E and Pounce 3.2E.

Table 7. Control of Russian wheat aphid with hand-applied insecticides in winter wheat, 1986-1999[1].

PRODUCT	LB (AI)/ACRE	TESTS WITH > 90% CONTROL	TOTAL TESTS	% TESTS
LORSBAN 4E	0.50	20	36	56
DI-SYSTON 8E	0.75	13	38	34
DIMETHOATE 4E	0.375	6	30	20
DI-SYSTON 8E	0.50	2	10	20
PENNCAP M	0.75	3	18	17
LORSBAN 4E	0.25	4	17	24
THIODAN 3E	0.50	1	4	25
WARRIOR 1E	0.03	1	10	10

[1]Includes data from several states.

Table 8. Control of spider mites in artificially-infested corn with hand-applied insecticides, ARDEC, 1993-1999.

PRODUCT	LB (AI)/ACRE	% REDUCTION IN TOTAL MITE DAYS[1]
CAPTURE 2E	0.08	57 (7)
CAPTURE 2E + DIMETHOATE	0.08 + 0.50	68 (7)
CAPTURE 2E + FURADAN 4F	0.08 + 0.50	66 (4)
COMITE II	1.64	23 (7)
COMITE II + DIMETHOATE	1.64 + 0.50	61 (4)
DIMETHOATE	0.50	57 (7)
FURADAN 4F	1.00	47 (7)

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

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PRODUCT INDEX