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Agricultural Experiment Station

College of Agricultural Sciences

Department of Bioagricultural Sciences and Pest Management

Cooperative Extension

Colorado State University

Knowledge to Go Places

2005 Colorado Field Crop Insect Management Research and Demonstration Trials

2005 Colorado Field Crop Insect Management Research and Demonstration Trials[1]

Frank B. Peairs[2]
Jeff Rudolph[2]
Terri L. Randolph[2]
Shawn M. Walter[2]
Assefa Gebre-Amlak[3]

[1]Mention of a trademark or proprietary product does not constitute endorsement by the Colorado Agricultural Experiment Station.
[2]Department of Bioagricultural Sciences and Pest Management, Colorado State University
[3]Golden Plains Area Cooperative Extension, Colorado State University

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Jeff Rudolph, Terri Randolph, Hayley Miller, Frank Peairs, Jake Walker, Will Pessetto, Betsy Bosley, Sam Gray,
Department of Bioagricultural Sciences and Pest Management

CONTROL OF RUSSIAN WHEAT APHID IN WINTER WHEAT WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2005: Treatments were applied on 10 May 2005 with a 'rickshaw-type' CO_2 powered sprayer calibrated to apply 20 gal/acre at 3 mph and 32 psi through three 8004 (LF4) nozzles mounted on a 5.0 ft boom. Conditions were 30% cloud cover, calm, and temperatures of 52°F (start) to 60°F (finish) at the time of treatment. There were rainfall events of 0.02 inches and 0.8 inches on the day of treatment and the following day, respectively. Plots were 6 rows (5.0 ft) by 28.0 ft and were arranged in six replicates of a randomized, complete block design. Crop stage at application was jointing (Zadoks 30). The crop had been infested with greenhouse-reared aphids on 1 April 2005.

Treatments were evaluated by collecting 20 symptomatic tillers along the middle four rows of each plot 7, 14 and 21 days after treatment (DAT). Tiller samples were placed in Berlese funnels for 24 hours to extract aphids into alcohol for counting. Symptomatic tiller samples taken the day before treatment averaged 10.4 ± 2.0 Russian wheat aphids per tiller. Aphid counts transformed by the log +1 method were used for analysis of variance and mean separation by Tukey's HSD test (α=0.05). Original means are presented in the tables. Total insect days for each treatment were calculated according the method of Ruppel (Journal of Economic Entomology 76: 375-7, 1983) and analyzed in the same manner, with original means presented in Table 1. Reductions in insect days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100).

Aphid pressure was as severe as in past artificially-infested winter wheat experiments, with about 58 aphids/tiller in the untreated control 21 DAT (Table 1). All treatments had fewer aphids than the untreated control 7 and 21 DAT. All treatments, except the dimethoate and the lower rate of Mustang Max, had fewer aphids than the untreated control 14 DAT. All treatments had fewer aphid days than the untreated control. Lorsban 4E, 0.5 lb (AI)/acre reduced total aphid days over three weeks by 90%, the level of performance observed by the more effective treatments in past experiments. No phytotoxicity was observed with any treatment.

Field History

Pest:	Russian wheat aphid, *Diuraphis noxia* (Kurdjumov)
Cultivar:	'Akron'
Planting Date:	8 September 2004
Irrigation:	Post planting, linear move sprinkler with drop nozzles
Crop History:	Fallow in 2003
Herbicide:	Harmony Extra, 0.5 oz/acre, and Bronate Advanced, 0.6 pint/acre
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Sandy clay loam, OM 2.1%, pH 7.4
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (south end of Block 1030 West)

Table 1. Control of Russian wheat aphid with hand-applied insecticides, ARDEC, Fort Collins, CO. 2005.

PRODUCT, LB (AI)/ACRE	APHIDS PER TILLER ± SE[1] 7 DAT		14 DAT		21 DAT		TOTAL APHID DAYS PER TILLER ± SE[1]		% REDUCTION IN APHID DAYS[2]
Lorsban 4E, 0.5	1.5 ± 0.4	BC	0.3 ± 0.1	B	1.5 ± 0.4	CDE	48.5 ± 3.3	D	90
Di-Syston 8E, 0.75	0.8 ± 0.4	C	0.5 ± 0.2	B	0.9 ± 0.3	DE	54.3 ± 3.3	CD	89
Lorsban 4E, 0.38	1.4 ± 0.3	BC	0.6 ± 0.2	B	1.4 ± 0.6	E	55.2 ± 3.4	CD	89
Warrior, 0.03	1.9 ± 0.4	BC	1.4 ± 0.5	B	7.7 ± 0.9	B	55.5 ± 5.7	CD	89
Warrior, 0.01	3.2 ± 0.6	B	1.9 ± 0.3	AB	4.9 ± 1.5	BC	77.6 ± 7.4	BCD	84
Mustang Max 0.8 E, 0.025	2.9 ± 0.5	B	2.2 ± 0.5	AB	12.0 ± 1.4	B	86.4 ± 5.0	BCD	82
dimethoate 4E 0.38	3.0 ± 1.0	BC	0.7 ± 0.3	B	4.4 ± 0.9	BC	89.7 ± 9.2	BC	82
Lorsban 4E, 0.25	1.8 ± 0.5	BC	0.6 ± 0.3	B	0.6 ± 0.3	E	93.8 ± 32.1	BC	81
Mustang Max 0.8 E, 0.02	4.2 ± 3.0	BC	1.0 ± 0.7	B	5.9 ± 2.3	BCD	114.0 ± 7.7	B	76
Untreated control	22.2 ± 1.7	A	12.6 ± 3.0	A	58.5 ± 3.7	A	485.2 ± 36.7	A	–
F Value	8.61		8.21		20.08		34.52		–
p> F	<0.0001		<0.0001		<0.0001		<0.0001		–

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

CONTROL OF RUSSIAN WHEAT APHID IN SPRING BARLEY WITH GROUND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2005

Jeff Rudolph, Terri Randolph, Hayley Miller, Will Pessetto, Jake Walker, Sam Gray, Betsy Bosley, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF RUSSIAN WHEAT APHID IN SPRING BARLEY WITH GROUND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2005: Treatments were applied on 28 June 2005 with an ATV-mounted sprayer calibrated to apply 22.6 gal/acre at 5 mph and 32 psi through 6 8003XR nozzles mounted on a 10.0 ft boom. Conditions were <10% cloud cover, SE winds 0-5 mph, and temperatures of 70°F (start) to 73°F (finish) at the time of treatment. There were no rainfall events on the day of treatment or the following day. Plots were 30 rows (30 ft) by 100 ft and were arranged in eight replicates of a randomized, complete block design. Crop stage at application was boot (Zadoks 40). The crop was naturally infested, and a pretreatment symptomatic tiller sample averaged 24.3 aphids per tiller on 22 June 2005.

Treatments were evaluated by collecting 20 symptomatic tillers along the middle four rows of each plot 7, 14 and 21 DAT. Tiller samples were placed in Berlese funnels for 24 hours to extract aphids into alcohol for counting. Aphid counts transformed by the square root +0.5 method were used for analysis of variance and mean separation by Tukey's HSD test (α=0.05). Original means are presented in the tables. Percentage reductions were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100).

Aphid pressure was initially severe because of the late planting date, but declined during the experiment due to the effects of summer temperatures and crop maturation. The Lannate LV treatment had fewer aphids than the untreated control at all three post treatment sample dates (Table 2). No phytotoxicity was observed.

Field History

Pest:	Russian wheat aphid, *Diuraphis noxia* (Kurdjumov)
Cultivar:	'Otis'
Planting Date:	16 May 2005
Irrigation:	Post planting, linear move sprinkler with drop nozzles
Crop History:	Corn in 2004
Herbicide:	None
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Sandy clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (Block 1070)

Table 2. Control of Russian wheat aphid in barley with Lannate LV, ARDEC, Fort Collins, CO. 2005

PRODUCT, Lb (AI)/Acre	RUSSIAN WHEAT APHIDS PER TILLER ± SEM[1] (% REDUCTION)		
	7 DAT	14 DAT	21 DAT
Lannate LV, 0.45	7.8 ± 2.7 (82)	3.2 ± 1.1 (84)	0.9 ± 0.2 (70)
Untreated Control	42.4 ± 10.9	19.4 ± 7.0	3.0 ± 0.7
F value	47.82	9.32	14.77
P>f	0.0002	0.0185	0.0064

[1]SEM, standard error of the mean

CONTROL OF ALFALFA INSECTS IN ALFALFA WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2005

Shawn Walter, Jeff Rudolph, Terri Randolph, Hayley Miller, Silas Davidson, Will Pessetto, Jake Walker, Sam Gray, Betsy Bosley, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF ALFALFA INSECTS IN ALFALFA WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2005: Early treatments were applied on 5 May 2005 with a 'rickshaw-type' CO_2 powered sprayer calibrated to apply 20 gal/acre at 3 mph and 30 psi through six XR8002VS nozzles mounted on a 10.0 ft boom. Early treatments were made approximately when army cutworm treatments are applied in the region. This was done to determine the effect of army cutworm treatment in alfalfa on subsequent alfalfa weevil larval densities. All other treatments were applied in the same manner on 24 May 2005. Conditions were 20% cloud cover with calm winds with a temperature of 55°F at the time of early treatments. Conditions were 30% cloud cover with calm winds and a temperature of 60-72°F at the time of the later treatments. Plots were 10.0 ft by 25.0 ft and arranged in four replicates of a randomized, complete block design. Untreated control and Lorsban 4F, 0.75 plots were replicated eight times for a more accurate comparison of treatment effects on yield (insect counts from four plots of each treatment were included in the analyses described below). The crop was breaking dormancy at the time of early treatments. Crop height at the time of late treatments was 2.0 ft.

Treatments were evaluated by taking ten 180° sweeps per plot with a standard 15 inch diameter insect net 7, 14 and 21 d days after the later treatments (DAT). Alfalfa weevil larvae, alfalfa weevil adults and pea aphids were counted. A pretreatment sample was taken three days prior to the later treatments by taking 200, 180° sweeps across the experimental area. This sample averaged 16.1 and 16.9 alfalfa weevil larvae and pea aphids per sweep, respectively. Insect counts transformed by the square root + 0.5 method were used for analysis of variance and mean separation by Tukey's HSD procedure (α=0.05). Original means are presented in the tables. Yields were taken in the Lorsban 4E, 0.75 (AI)/acre, and untreated control plots on 15 June 2005 with a Carter forage harvester. Yields were converted to tons per acre adjusted by subsample moisture. Treated plots were compared to the untreated control using a two-tailed t-test with assumed equal variance (α=0.05).

Alfalfa weevil larval densities were similar to previous years, while pea aphid abundance was two to three times greater than observed in 2004. All treatments had fewer alfalfa weevil larvae than the untreated control 7, 14 and 21 DAT (Table 3). No treatment had fewer alfalfa weevil adults than the untreated control at any evaluation date (Table 4). Baythroid 2E, 0.044, Mustang Max 0.8EC, 0.025, Baythroid XL, 0.022, Lorsban 4F, 0.75, and Furadan 4F, 0.50, had fewer pea aphids than the untreated control 7 DAT. The majority of treatments had fewer pea aphids than the untreated control 14 DAT. Warrior 1E, 0.03, Warrior 1E, 0.02, and Baythroid 2E, 0.044 had fewer pea aphids than the untreated control 21 DAT (Table 5). No phytotoxicity was observed with any treatment. The plots treated with Lorsban 4E, 0.75 lb (AI)/acre, yielded 1.7 tons/acre, 7.0% more than the untreated plots which yielded 1.6 tons/acre. The difference was not significant (paired t-test, $t=-1.99$, $df=7$, $p(t>t_{0.05})=0.0868$). Yield reduction measured since 1995 has averaged 7.1%, with a range of 0.0% to 20.9%.

Field History

Pests:	Alfalfa weevil, *Hypera postica* (Gyllenhal)
	Pea aphid, *Acyrthosiphon pisum* (Harris)
Cultivar:	Unknown
Plant Stand:	Mostly uniform, some weeds
Irrigation:	Linear move sprinkler with drop nozzles
Crop History:	Alfalfa in 2002, 2003, 2004
Herbicide:	None
Insecticide:	None prior to experiment
Fertilization:	None
Soil Type:	Sandy clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO, 80524 (Block 1060 south)

Table 3. Control of alfalfa weevil larvae, ARDEC, Fort Collins, CO, 2005.

PRODUCT, LB (AI)/ACRE	ALFALFA WEEVIL LARVAE PER SWEEP ± SEM[1]					
	7 DAT		14 DAT		21 DAT	
Baythroid 2E, 0.044	0.4 ± 0.2	C	0.0 ± 0.0	B	0.0 ± 0.0	B
Mustang Max 0.8EC, 0.025	0.1 ± 0.1	C	0.2 ± 0.9	B	0.0 ± 0.0	B
Warrior 1E, 0.02	0.4 ± 0.1	C	3.2 ± 25.6	B	0.0 ± 0.0	B
Baythroid XL, 0.022	0.2 ± 0.2	C	0.1 ± 0.0	B	0.0 ± 0.0	B
Warrior 1E, 0.03	0.4 ± 0.3	C	0.0 ± 0.0	B	0.0 ± 0.0	B
Mustang Max 0.8EC, 0.025, early	0.3 ± 0.2	C	1.3 ± 1.0	B	0.1 ± 0.1	B
Baythroid 2E, 0.025, early	0.4 ± 0.2	C	0.1 ± 0.1	B	0.1 ± 0.0	B
Baythroid 2E, 0.025	0.1 ± 0.0	C	0.0 ± 0.0	B	0.1 ± 0.0	B
Furadan 4F, 0.50	0.1 ± 0.1	C	1.0 ± 0.1	B	0.1 ± 0.1	B
Baythroid XL, 2.8 oz/acre, early	3.4 ± 3.3	BC	0.2 ± 0.1	B	0.1 ± 0.0	B
Baythroid 2E, 0.044, early	0.2 ± 0.1	C	0.1 ± 0.1	B	0.1 ± 0.1	B
Baythroid XL, 1.9 oz/acre, early	0.4 ± 0.1	C	0.4 ± 0.2	B	0.1 ± 0.1	B
Furadan 4F, 0.50 + Dimethoate 4E, 0.25	0.2 ± 0.2	C	0.2 ± 0.1	B	0.1 ± 0.1	B
Baythroid XL, 0.015	0.1 ± 0.1	C	0.2 ± 0.2	B	0.2 ± 0.1	B
Lorsban 4F, 0.75	0.1 ± 0.0	C	0.2 ± 0.0	B	0.2 ± 0.2	B
Furadan 4F, 0.25	0.4 ± 0.1	C	0.4 ± 0.1	B	0.3 ± 0.0	B
Renounce, 2.5oz/ac, 20%WP	9.6 ± 5.5	B	1.0 ± 0.3	B	0.9 ± 0.5	B
Untreated control	23.0 ± 2.7	A	16.6 ± 1.4	A	6.9 ± 2.4	A
F value	12.79		14.40		16.43	
p>F	0.0008		<0.0001		<0.0001	

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

Table 4. Control of alfalfa weevil adults, ARDEC, Fort Collins, CO, 2005.

	ALFALFA WEEVIL ADULTS PER SWEEP ± SEM[1]		
PRODUCT, LB (AI)/ACRE	7 DAT	14 DAT	21 DAT
Lorsban 4F, 0.75	0.1 ± 0.7	0.0 ± 0.0 A	0.1 ± 0.1
Baythroid 2E, 0.044	0.0 ± 0.0	0.0 ± 0.0 A	0.1 ± 0.0
Baythroid 2E, 0.044, early	0.1 ± 0.1	0.0 ± 0.0 A	0.0 ± 0.0
Baythroid 2E, 0.025	0.0 ± 0.0	0.0 ± 0.0 A	0.1 ± 0.0
Baythroid XL, 2.8 oz/acre, early	0.2 ± 0.2	0.0 ± 0.0 A	0.1 ± 0.0
Furadan 4F, 0.25	0.0 ± 0.0	0.0 ± 0.0 A	0.1 ± 0.1
Baythroid XL, 0.022 (2.8 oz/acre)	0.1 ± 0.1	0.1 ± 0.0 A	0.2 ± 0.2
Warrior 1E, 0.03	0.0 ± 0.0	0.1 ± 0.1 A	0.3 ± 0.1
Mustang Max 0.8EC, 0.025, early	0.1 ± 0.0	0.1 ± 0.1 A	0.0 ± 0.0
Furadan 4F, 0.50 + Dimethoate 4E, 0.25	0.1 ± 0.0	0.1 ± 0.0 A	0.0 ± 0.0
Warrior 1E, 0.02	0.1 ± 0.0	0.1 ± 0.0 A	0.2 ± 0.1
Baythroid 2E, 0.025, early	0.1 ± 0.1	0.1 ± 0.0 A	0.1 ± 0.1
Baythroid XL, 1.9 oz/acre, early	0.1 ± 0.1	0.1 ± 0.0 A	0.0 ± 0.0
Baythroid XL, 0.015 (1.9 oz/acre)	0.0 ± 0.0	0.1 ± 0.1 A	0.2 ± 0.1
Mustang Max 0.8EC, 0.025	0.0 ± 0.0	0.1 ± 0.0 A	0.3 ± 0.2
Furadan 4F, 0.50	0.0 ± 0.0	0.2 ± 0.1 A	0.1 ± 0.1
Untreated control	0.0 ± 0.0	0.2 ± 0.1 A	0.1 ± 0.1
Renounce, 2.5oz/ac, 20%WP	0.3 ± 0.2	0.2 ± 0.1 A	0.3 ± 0.1
F value	1.16	1.91	1.59
p>F	0.3271	0.0390	0.1007

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

Table 5. Control of pea aphids, ARDEC, Fort Collins, CO, 2005.

PRODUCT, LB (AI)/ACRE	PEA APHIDS PER SWEEP ± SEM[1] 7 DAT		14 DAT		21 DAT	
Warrior 1E, 0.03	15.7 ± 8.9	ABCD	2.9 ± 0.7	F	6.0 ± 0.2	D
Warrior 1E, 0.02	20.8 ± 13.9	ABCD	5.0 ± 1.5	EF	10.2 ± 1.3	CD
Baythroid 2E, 0.044	3.7 ± 0.9	CD	4.0 ± 0.9	F	16.2 ± 4.5	BCD
Furadan 4F, 0.50 + Dimethoate 4E, 0.25	7.9 ± 2.4	ABCD	7.0 ± 1.6	DEF	16.8 ± 1.5	ABCD
Mustang Max 0.8EC, 0.025	2.9 ± 0.6	D	12.3 ± 3.2	BCDEF	20.6 ± 3.1	ABCD
Baythroid 2E, 0.025	11.9 ± 7.2	ABCD	17.5 ± 4.0	ABCDEF	21.4 ± 4.8	ABCD
Baythroid XL, 0.022 (2.8 oz/acre)	5.2 ± 1.8	BCD	6.4 ± 2.8	EF	24.3 ± 7.2	ABCD
Lorsban 4F, 0.75	3.1 ± 0.7	CD	8.9 ± 1.9	CDEF	26.3 ± 4.4	ABCD
Furadan 4F, 0.50	5.1 ± 1.0	BCD	10.2 ± 2.4	BCDEF	31.4 ± 5.6	ABCD
Renounce, 2.5oz/ac, 20%WP	23.2 ± 9.6	ABCD	22.2 ± 4.5	ABCDE	33.9 ± 7.1	ABC
Baythroid XL, 0.015 (1.9 oz/acre)	7.9 ± 2.4	ABCD	11.8 ± 1.5	BCDEF	34.9 ± 6.1	ABC
Mustang Max 0.8EC, 0.025, early	27.6 ± 3.3	ABC	27.9 ± 2.7	ABC	38.6 ± 7.5	ABC
Baythroid 2E, 0.044, early	30.2 ± 1.8	AB	30.3 ± 0.7	ABC	46.8 ± 8.5	AB
Baythroid XL, 0.022, early	20.5 ± 4.2	ABCD	32.7 ± 8.9	ABC	49.7 ± 6.3	AB
Baythroid 2E, 0.025, early	26.1 ± 8.4	ABCD	27.3 ± 48	ABCD	53.5 ± 12.6	AB
Furadan 4F, 0.25	22.7 ± 6.5	ABCD	11.9 ± 2.6	BCDEF	53.9 ± 12.2	AB
Baythroid XL, 0.015, early	31.8 ± 7.7	AB	32.8 ± 2.9	AB	55.4 ± 16.2	A
Untreated control	34.0 ± 6.6	A	48.8 ± 15.5	A	58.3 ± 28.0	A
F value	4.40		8.87		5.55	
p>F	<0.0001		<0.0001		<0.0001	

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

CONTROL OF WESTERN CORN ROOTWORM IN CORN, ARDEC, FORT COLLINS, CO, 2005

Shawn Walter, Jeff Rudolph, Terri Randolph, Laurie Kerzicnik, Hayley Miller, Silas Davidson, Aubrey Sloat, Will Pessetto, Jake Walker, Sam Gray, Betsy Bosley, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF WESTERN CORN ROOTWORM IN CORN, ARDEC, FORT COLLINS, CO, 2005: All treatments were planted on 18-19 May 2005. Granular insecticides were applied with modified Wintersteiger meters mounted on a two-row John Deere Maxi-Merge planter. T-band granular applications were applied with a 4-inch John Deere spreader located between the disk openers and the press wheel. Plots were one 50-ft row arranged in six replicates of a randomized complete block design.

Cultivation treatments were applied on 21 June 2005. Cultivation treatments were in a seven inch band over the row applied with modified Wintersteiger meters and incorporated with a two-row Hawkins ditcher. Plots were one 50-ft row arranged in six replicates of a randomized complete block design.

Treatments were evaluated by digging three plants per plot on 12 July 2005. The roots were washed and the damage rated on the Iowa 1-6 scale (Witkowski, J.F., D.L. Keith and Z.B. Mayo. 1982. Evaluating corn rootworm soil insecticide performance. University of Nebraska Cooperative Extension NebGuide G82-597, 2 pp.) Plot means were used for analysis of variance and mean separation by Tukey's HSD method (α=0.05). Treatment efficiency was determined as the percentage of total plants per treatment having a root rating of 3.0 or lower.

Western corn rootworm pressure was moderate, with the untreated controls rating 4.1 and 4.7. The negative isoline for the MIR604 event was more damaged across treatments than the local hybrid (linear contrast, p = 0.0018). Conventional planting time treatments generally performed well. The transgenic event MIR604 performed as well as the better conventional treatments (Table 6). No cultivation treatments had less damage than the untreated control, possibly because application was delayed by weather (Table 7). No phytotoxicity was observed with any treatment.

Plots treated with Counter 15G at planting yielded 129 bushels/acre, 10.4% less than the untreated plots which yielded 144 bushels/acre. The difference was not significant (paired t-test, t=-0.56, df=11, $p(t>t_{0.05})$ =0.5890). Yield reduction measured between 1987-2005 have averaged 12.5%, with a range of 0% to 31%. Grain was hand harvested, and this comparison does not take into account any losses due to lodging.

Field History

Pest:	Western corn rootworm, *Diabrotica virgifera virgifera* LeConte
Cultivar:	Garst 8802
Planting Date:	18-19 May 2005
Plant Population:	31,500
Irrigation:	furrow
Crop History:	Corn in 2001-2004
Insecticide:	None prior to experiment
Soil Type:	Clay loam
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (northeast edge of Block 3100)

Table 6. Control of western corn rootworm with planting and seed treatments, ARDEC, Fort Collins, 2005

PRODUCT, OZ/1000 ROW FT	ROOT RATING[1]	EFFICIENCY[2]
Poncho, 1.25 Mg Ai/seed	1.9 C	100
Aztec 2.1G, 6.7 oz + Poncho, 1.25 Mg Ai/seed	2.0 C	100
Aztec 2.1G, 6.7 oz	2.0 C	100
Force 3G, 5 oz	2.0 C	100
Aztec 2.1G, 6.7 oz + Poncho, 0.25 Mg Ai/seed	2.1 C	100
MIR604	2.2 BC	100
Lorsban 15G, 8 oz	2.4 BC	94
Counter 15G, 8 oz [3]	2.6 BC	92
MIR604 (negative isoline) + Lorsban 15G, 8 oz	2.6 BC	89
Cruiser 5FS, 1.25 Mg Ai/seed	2.7 BC	67
Poncho, 0.25 Mg Ai/seed	2.7 BC	78
MIR604 (negative isoline) + Poncho, 1.25 mg AI/seed	2.8 ABC	72
MIR604 (negative isoline) + Cruiser 5FS 1.25mg AI/seed	2.9 ABC	78
MIR604 (negative isoline) + Aztec 2.1G, 6.7 oz	3.1 ABC	61
MIR604 (negative isoline) + Force 3G, 4 oz	3.4 ABC	61
MIR604 (negative isoline) + Cruiser 5FS 0.25mg AI/seed	3.6 ABC	61
Untreated Control [3]	4.1 AB	39
MIR604 (negative isoline) untreated	4.7 A	17
F Value	3.99	---
p > F	< 0.0001	---

[1]Iowa 1-6 rootworm damage scale. Means followed by the same letter(s) are not statistically different, Tukey's HSD (α=0.05).
[2]Percentage of 18 plants (total in 6 replicates of a treatment) with a rating of 3.0 or less.
[3]Treatment repeated (12 replicates rather than 6) for purpose of measuring yield.

Table 7. Control of western corn rootworm with cultivation treatments, ARDEC, Fort Collins, 2005

PRODUCT, OZ/1000 ROW FT	ROOT RATING[1]	EFFICIENCY[2]
Lorsban 15G, 8 oz	3.1	72
Counter 15G, 8 oz	3.5	61
Force 3G, 5 oz	3.9	61
Untreated Control	4.3	28
F Value	1.61	---
p > F	0.2443	---

[1]Iowa 1-6 rootworm damage scale.
[2]Percentage of 18 plants (total in 6 replicates of a treatment) with a rating of 3.0 or less.

CONTROL OF WESTERN BEAN CUTWORM IN CORN WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2005

Silas Davidson, Terri Randolph, Jeff Rudolph, Frank Peairs, Department of Bioagricultural Sciences and Pest Management

CONTROL OF WESTERN BEAN CUTWORM IN CORN WITH HAND-APPLIED INSECTICIDES, ARDEC, FORT COLLINS, CO, 2005: Treatments were applied on 10 August 2005 using a 2 row boom sprayer mounted on a backpack calibrated to deliver 17.8 gal/acre at 32 psi with three XR8002VS nozzles. Conditions were 75% cloud cover, calm and 68°F temperature at the time of treatment. A precipitation event of 0.10 inches had occurred less than 24 h before treatment. 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 28 July 2005 by placing a field-collected egg mass in the ear leaf axil of five plants per row.

Treatments were evaluated by counting larvae and cavities on the primary ear of 50 plants per plot on 31 August. Western bean cutworm counts (larvae + cavities) were transformed by the square root + 0.5 method prior to analysis of variance and means separation by the Tukey's HSD method (α=0.05). Percent control was calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100). Original counts are presented in Table 8.

The controlled infestation was moderately effective, but densities in the untreated control were not as high as would be expected in a heavy natural infestation. The pyrethroid treatments provided 100% control and had significantly fewer larvae per plot than the untreated control. The Success treatments were not different from the untreated control, but a rate response was observed (Table 8). No phytotoxicity was observed with any treatment.

Field History

Pest:	Western bean cutworm, *Richia albicosta* (Smith)
Cultivar:	Garst '8802'
Planting Date:	10 May 2005
Plant Population:	32,000
Irrigation:	Linear move sprinkler with drop nozzles
Crop History:	Spring wheat in 2004
Herbicide:	Roundup UltraMax, 23 fl.oz./acre + 1% ammonium sulphate on 6 June 2005
Fertilization:	120 N, 80 P
Soil Type:	Loam, OM 6.2%, pH 7.7
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (Block 1080 south, west side)

Table 8. Control of western bean cutworm with hand-applied insecticides, ARDEC, Fort Collins, CO. 2005.

PRODUCT, LB (AI)/ACRE	LARVAE IN 50 EARS ± SEM[1]		% CONTROL
Mustang Max 0.08EC, 0.011	0.0 ± 0.0	B	100
Warrior 1EC, 0.015	0.0 ± 0.0	B	100
Success 2EC, 0.094 (6oz/Ac)	0.5 ± 0.3	AB	93
Success 2EC, 0.047 (3oz/Ac)	1.8 ± 1.1	AB	75
Untreated	7.2 ± 0.9	A	—
F Value	4.48		—
p>F	0.0191		—

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

CONTROL OF SPIDER MITES IN CORN WITH HAND-APPLIED INSECTICIDES AND MITICIDES, ARDEC, FORT COLLINS, CO, 2005

Terri Randolph, Jeff Rudolph, Aubrey Sloat, Frank Peairs, Laurie Kerzicnik, Hayley Miller, Silas Davidson, Sam Gray, Betsy Bosley, Will Pessetto, Jake Walker, Department of Bioagricultural Sciences and Pest Management

CONTROL OF SPIDER MITES IN CORN WITH HAND-APPLIED INSECTICIDES AND MITICIDES, ARDEC, FORT COLLINS, CO, 2005: Early treatments were applied on 5 August 2005 using a 2 row boom sprayer mounted on a backpack calibrated to deliver 17.8 gal/acre at 32 psi with three XR8002VS nozzles. All other treatments were applied in the same manner on 10 August 2005. Conditions were 85% cloud cover, SE winds 5-8 mph and 60°F temperature at the time of early treatments. A precipitation event of 0.26 inches had occurred less than 24 h before the early treatments. Conditions were 75% cloud cover, calm and 68°F temperature at the time of late treatments. A precipitation event of 0.10 inches had occurred less 24 h before the late treatments. 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 15 July 2005 by laying mite infested corn leaves across the corn plants on which mites were to be counted. On 18 July 2005, the experimental area was treated with Asana, 5.0 fl. oz./acre to control beneficial insects and to encourage buildup of spider mite densities.

Treatments were evaluated by collecting three leaves (ear leaf, 2nd leaf above the ear, 2nd leaf below the ear) from two plants per plot two days prior 7, 14 and 21 days after the later treatment (DAT). Corn leaves were placed in Berlese funnels for 48 hours to extract mites into alcohol for counting. All extracted mites were counted including males and juveniles. Since there was a mixed infestation of Banks grass mite and twospotted spider mite, the percentage of each species also was determined. A pretreatment sample taken on 8 August 2005 averaged 3.4 mites per leaf and comprised 80% Banks grass mites. Mite counts and mite days (calculated by the method of Ruppel, J. Econ. Entomol. 76: 375-377) were transformed by the square root + 0.5 method prior to analysis of variance and means separation by the Tukey's HSD method (α=0.05). Reductions in mite days were calculated by Abbott's (1925) formula: (percent reduction = ((untreated-treated)/untreated) X 100). Original mite counts 7, 14 and 21 DAT mite days accumulated are presented in Table 9.

Mite densities were low compared to other years. Capture 2E + dimethoate and Furadan 4F 1.00 had fewer mites than the untreated control 7 DAT (Table 9). No treatment effects for mites per leaf were observed 14 and 21 DAT (Table 9). Banks grass mite comprised 52, 62 and 50% of the infestation 7, 14 and 21 DAT, respectively. No treatment effects for mite days were observed. No phytotoxicity was observed with any treatment.

Field History

Pest:	Banks grass mite, *Oligonychus pratensis* (Banks) Twospotted spider mite, *Tetranychus urticae* Koch
Cultivar:	Garst '8802'
Planting Date:	10 May 2005
Plant Population:	32,000
Irrigation:	Linear move sprinkler with drop nozzles
Crop History:	Barley in 2004
Herbicide:	Roundup UltraMax, 23 fl.oz./acre + 1% ammonium sulphate on 6 June 2005
Fertilization:	120 N, 80 P
Soil Type:	Loam, OM 6.2%, pH 7.7
Location:	ARDEC, 4616 North Frontage Road, Fort Collins, CO 80524 (Block 1080 south) Table 1. Control of corn spider mites with hand-applied insecticides, ARDEC, Fort Collins, CO. 2005.

Table 9. Control of corn spider mites with hand-applied insecticides, ARDEC, Fort Collins, CO. 2005.

PRODUCT, LB (AI)/ACRE	MITES PER LEAF ± SEM[1] 7 DAT		14 DAT	21 DAT		MITE DAYS ± SEM[1,2]	% REDUCTION IN MITE DAYS
Agri-Mek 0.15, 0.0188 (16 oz/a)	1.5 ± 0.4	AB	7.2 ± 6.1	3.6 ± 1.3	B	297.5 ± 167.5	58
Oberon 240SC, 0.087 (5.7 oz/a) (Early) + Oberon 2SC, 0.087 (5.7 oz/a)	4.4 ± 1.2	AB	11.6 ± 5.5	10.9 ± 4.0	B	475.1 ± 170.2	33
Agri-Mek 0.15, 0.0094 (8 oz/a)	2.6 ± 0.6	AB	7.1 ± 4.3	11.9 ± 6.1	B	413.0 ± 128.4	42
Oberon 240SC + Dimethoate 4E, 0.087 (5.7 oz/a) + 0.50	1.7 ± 0.3	AB	6.6 ± 2.0	15.3 ± 4.9	AB	382.4 ± 107.3	46
Comite II 6E, 1.69	2.8 ± 0.9	AB	55.6 ± 43.9	18.7 ± 3.6	AB	1502.4 ± 954.6	-112
Oberon 240SC, 0.087 (5.7 oz/a) (Early)	3.2 ± 1.1	AB	7.1 ± 1.6	19.3 ± 10.0	AB	418.3 ± 113.0	41
Untreated control	7.3 ± 1.3	A	12.2 ± 4.9	20.9 ± 6.4	AB	709.6 ± 138.2	–
Capture 2E + Dimethoate 4E, 0.08 + 0.50	1.2 ± 0.5	B	13.6 ± 7.1	23.2 ± 12.4	AB	659.8 ± 304.3	7
Capture 2E, 0.08	2.8 ± 0.5	AB	6.2 ± 1.7	23.6 ± 9.9	AB	525.0 ± 103.3	26
Furadan 4F 1.00	1.3 ± 0.7	B	13.4 ± 5.6	23.9 ± 18.5	AB	649.3 ± 332.8	9
Furadan 4F + Dimethoate 4E, 1.00 + 0.50	3.8 ± 2.0	AB	13.1 ± 7.4	24.7 ± 6.3	AB	759.5 ± 260.9	-7
Comite II 6E + Dimethoate 4E, 1.69 + 0.50	4.1 ± 1.2	AB	16.0 ± 5.9	27.3 ± 5.7	AB	770.9 ± 168.7	-9
Oberon 240SC, 0.087 (5.7 oz/a)	5.1 ± 0.7	AB	14.9 ± 4.0	31.2 ± 9.4	AB	862.8 ± 177.0	-22
Dimethoate 4E, 0.50	3.3 ± 1.1	AB	14.3 ± 5.6	35.5 ± 12.2	AB	823.4 ± 199.1	-16
Comite II 6E, 1.69 (Early)	5.4 ± 2.3	AB	30.8 ± 11.7	65.8 ± 27.8	A	1452.5 ± 451.7	-105
F Value	2.41		1.04	2.38		1.86	–
p>F	0.0139		0.4343	0.0153		0.0607	–

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

PEST SURVEY RESULTS

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. The light trap results for European corn borer and western bean cutworm at four locations are presented in Figures 1-8.

Russian wheat aphid flights are monitored with Allison-Pike suction traps at four locations. Total trap catches for each year of trapping are presented in Figures 9-12. In addition, the adults of several economically significant caterpillar pests of field crops were monitored with pheromone traps at ARDEC (Fort Collins) and Briggsdale. These results are presented in Table 10.

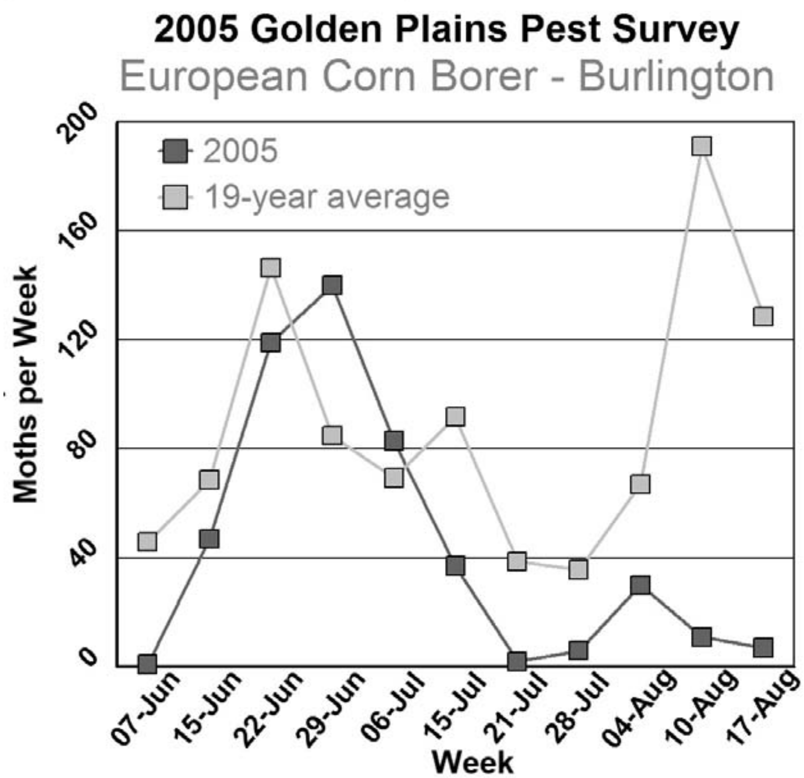


Figure 1

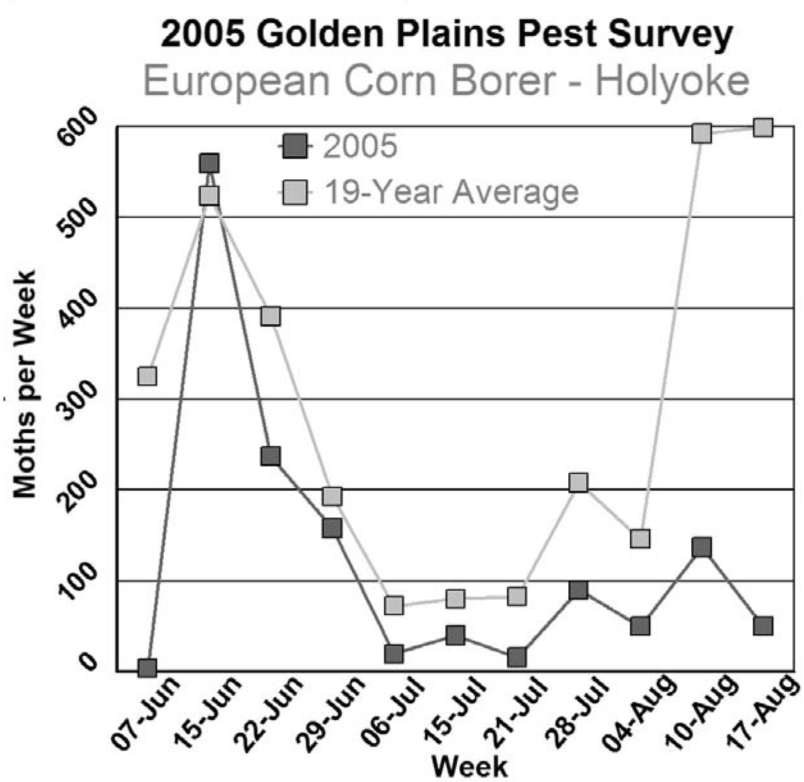


Figure 2

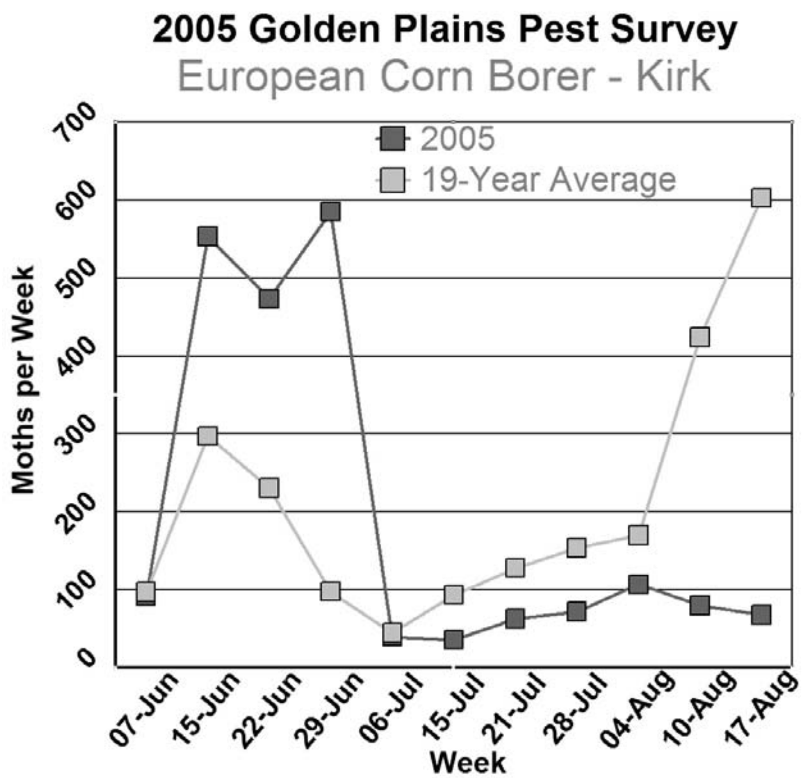
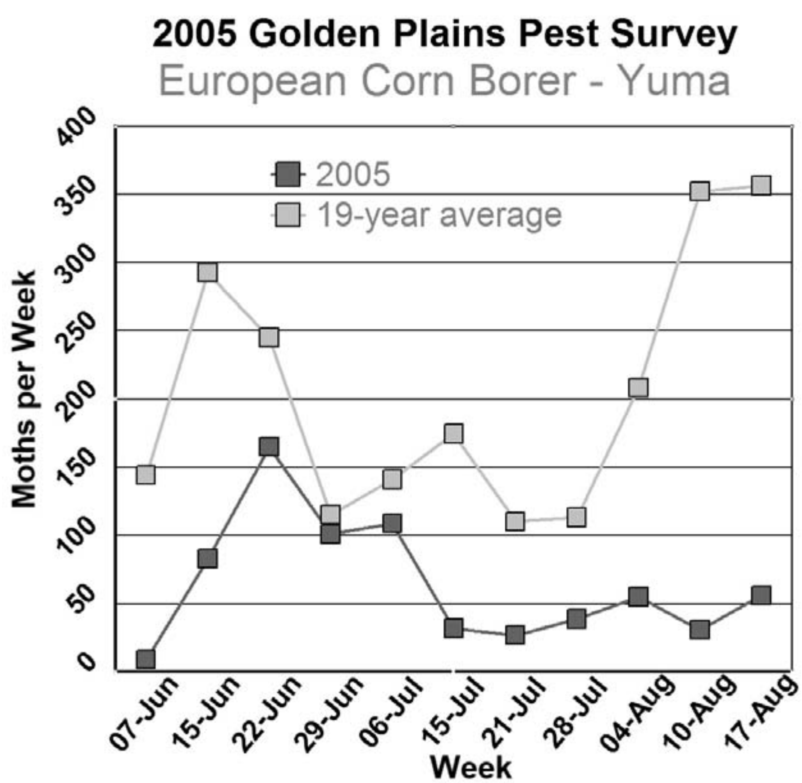


Figure 3



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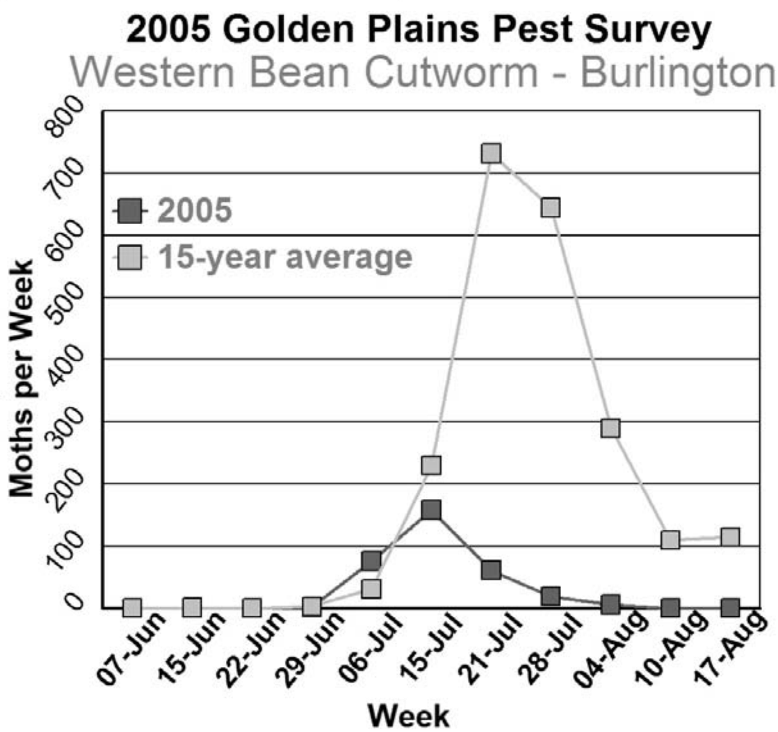

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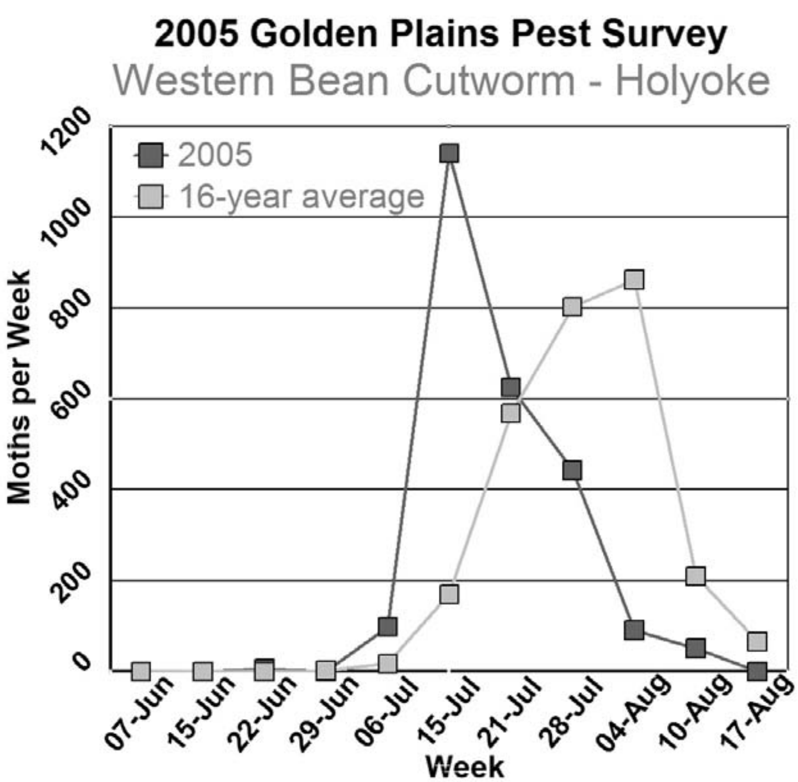

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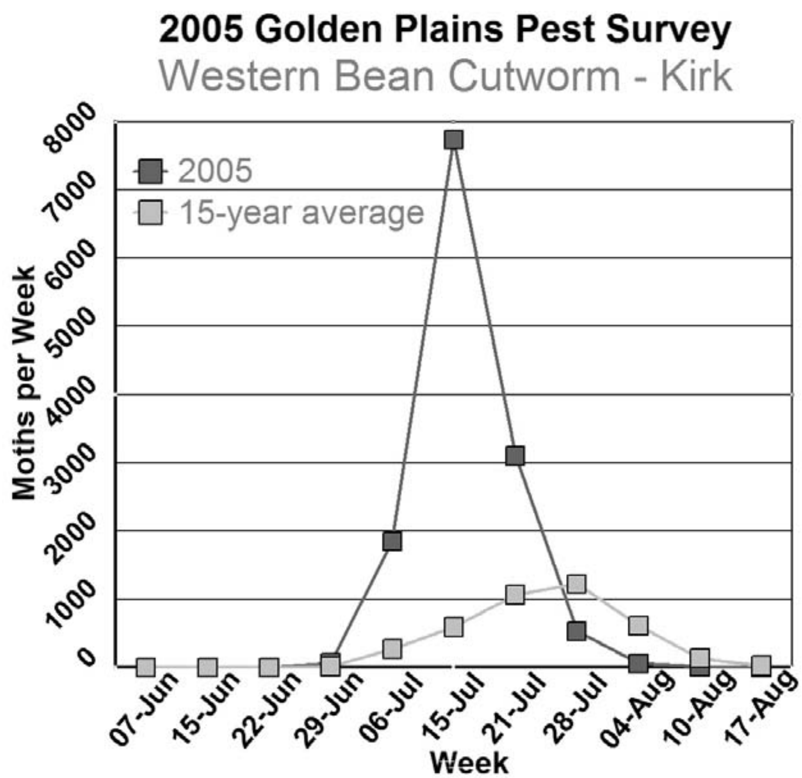

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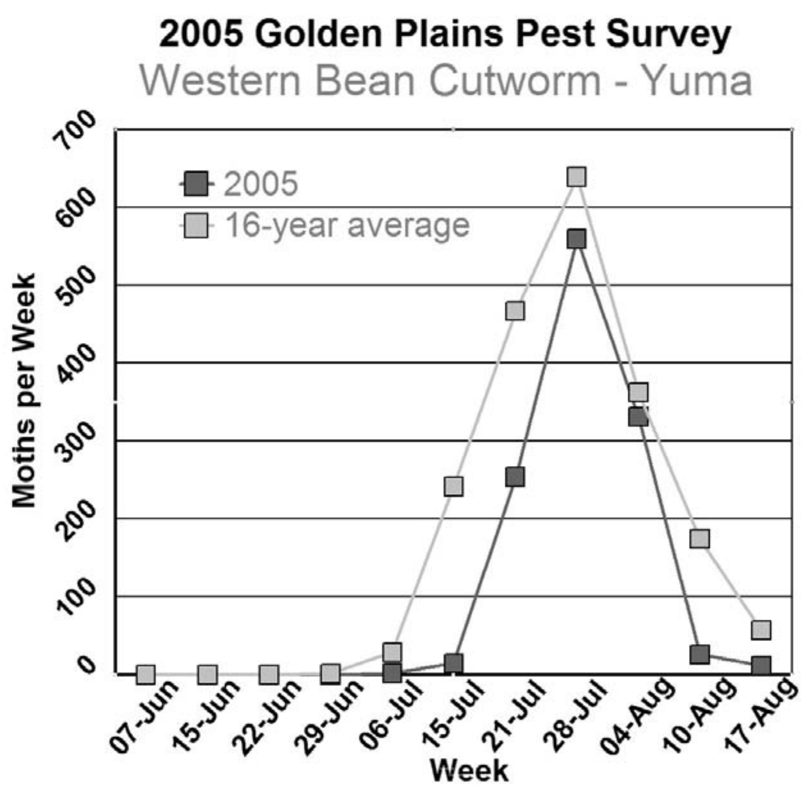

Figure 8

Figure 9

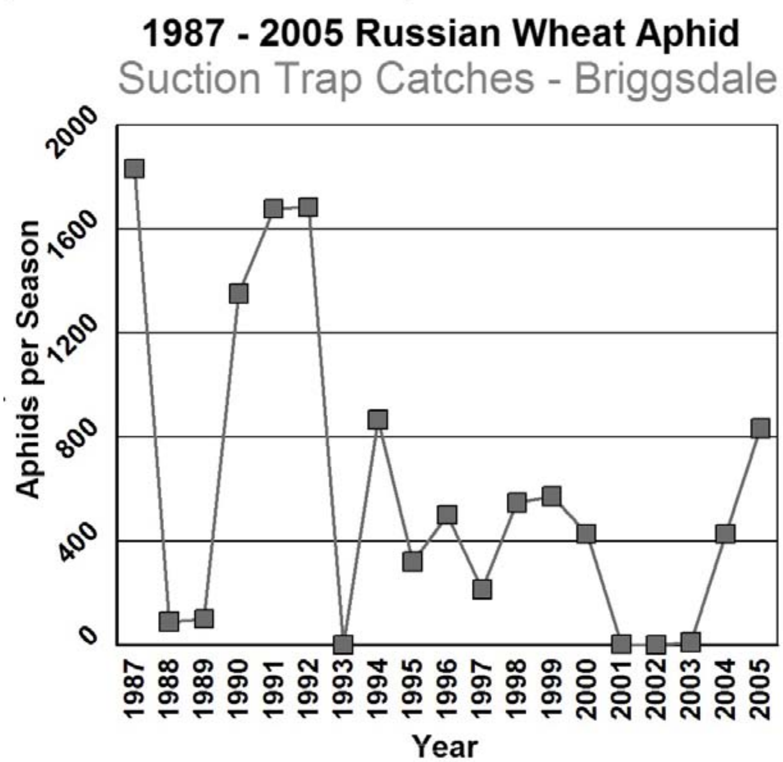

Figure 10

(Trap moved to ARDEC (Fort Collins) from Briggsdale in 1990, and to another Briggsdale in 1999. Trap was out of service June-August 2002, April-May 2003 and 2005.)

Figure 11

(Trap disabled during 1998 season.)

Figure 12

Table 10. 2005 pheromone trap catches at ARDEC and Briggsdale.

	Location					
	ARDEC – 1070		**ARDEC – Kerble**		**Briggsdale**	
Species	**Total Caught**	**Trapping Period**	**Total Caught[2]**	**Trapping Period[2]**	**Total Caught[2]**	**Trapping Period[2]**
Army cutworm	84	9/6 - 10/3	— **	—	127	9/13 - 10/3
Banded sunflower moth	0	6/27 - 8/8	22	6/27 - 8/8	4	6/27 - 8/8
European corn borer (NY)[1]	8	5/30 - 9/12	10	5/30 - 9/12	—	—
European corn borer (IA)	133	5/30 - 9/12	70	5/30 - 9/12	18	5/30 - 9/12
Fall armyworm	200	7/4 - 10/3	238	7/4 - 10/3	97	7/4 - 10/3
Pale western cutworm	150	9/12 - 10/3	—	—	275	9/12 - 10/3
Sunflower moth	0	6/27 - 8/8	2	6/27 - 8/8	1	6/27 - 8/8
Western bean cutworm	5	6/27 - 8/8	5	6/27 - 8/8	2	6/27 - 8/8

[1] NY, New York strain. IA, Iowa strain.
[2]—, not trapped.

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 2005.

Table 11. Performance of planting-time insecticides against western corn rootworm, 1987-2005, in northern Colorado

INSECTICIDE	IOWA 1-6 ROOT RATING[1]
AZTEC 2.1G	2.6 (27)
COUNTER 15G	2.6 (30)
COUNTER 20CR	2.6 (40)
CRUISER, 1.25 mg (AI)/seed	2.5 (3)
FORCE 1.5G (8 OZ) or 3G (4 OZ)	2.7 (28)
FORCE 3G (5 OZ)	2.8 (5)
FORTRESS 5G	2.8 (14)
LORSBAN 15G	3.0 (23)
PONCHO, 1.25 mg (AI)/seed	2.4 (5)
REGENT 4SC, 3-5 GPA	3.0 (5)
THIMET 20G	3.4 (15)
UNTREATED CONTROL	4.1 (34)

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

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

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

Table 13. Insecticide performance against first generation European corn borer, 1982-2002, in northeast Colorado.

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

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

Table 14. Insecticide performance against western bean cutworm, 1982-2002, in northeast Colorado.

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

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

Table 15. Insecticide performance against second generation European corn borer, 1982-2002, in northeast Colorado.

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

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

Table 16. Performance of hand-applied insecticides against alfalfa weevil larvae, 1984-2005, in northern Colorado.

PRODUCT	LB (AI)/ACRE	% CONTROL AT 2 WK[1]
BAYTHROID 2E	0.025	97 (12)
BAYTHROID 2E	0.025 (early)[3]	98 (3)
FURADAN 4F	0.25	86 (14)
FURADAN 4F	0.50	91 (27)
FURADAN 4F+DIMETHOATE 4E	0.50 + 0.25	89 (8)
LORSBAN 4E	0.75	93 (19)
LORSBAN 4E	1.00	96 (6)
LORSBAN 4E	0.50	83 (10)
MUSTANG MAX	0.025	88 (3)
MUSTANG MAX	0.025 (early)[3]	94 (3)
PENNCAP M	0.75	84 (11)
PERMETHRIN [2]	0.10	67 (7)
PERMETHRIN [2]	0.20	80 (4)
STEWARD	0.065	75 (4)
STEWARD	0.110	83 (4)
WARRIOR 1E or T	0.02	92 (16)
WARRIOR 1E or T	0.02 (early)[3]	61 (4)
WARRIOR 1E or T	0.03	92 (5)

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

Table 17. Control of Russian wheat aphid with hand-applied insecticides in winter wheat, 1986-2005[1].

PRODUCT	LB (AI)/ACRE	TESTS WITH > 90% CONTROL	TOTAL TESTS	% TESTS
LORSBAN 4E	0.50	25	41	61
DI-SYSTON 8E	0.75	17	43	40
DIMETHOATE 4E	0.375	8	35	23
DI-SYSTON 8E	0.50	2	10	20
MUSTANG MAX	0.025	1	3	33
PENNCAP M	0.75	3	18	17
LORSBAN 4E	0.25	9	23	39
LORSBAN 4E	0.38	3	4	75
THIODAN 3E	0.50	1	4	25
WARRIOR 1E	0.03	2	13	18

[1]Includes data from several states.

Table 18. Control of spider mites in artificially-infested corn with hand-applied insecticides, ARDEC, 1993-2005.

PRODUCT	LB (AI)/ACRE	% REDUCTION IN TOTAL MITE DAYS[1]
CAPTURE 2E	0.08	55 (12)
CAPTURE 2E + DIMETHOATE 4E	0.08 + 0.50	63 (12)
CAPTURE 2E + FURADAN 4F	0.08 + 0.50	66 (4)
COMITE II	1.64	15 (10)
COMITE II	2.53	51 (4)
COMITE II + DIMETHOATE 4E	1.64 + 0.50	50 (7)
DIMETHOATE 4E	0.50	44 (12)
FURADAN 4F	1.00	40 (12)
FURADAN 4F + DIMETHOATE 4E	1.00 + 0.50	42 (7)

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

Table 19. Control of sunflower stem weevil with planting and cultivation treatments, USDA Central Great Plains Research Station, 1998-2002.

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

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

ACKNOWLEDGMENTS

2005 COOPERATORS

PROJECT	LOCATION	COOPERATORS
Alfalfa insecticides	ARDEC, Fort Collins	Reg Koll, Mike Matsuda, Chris Fryrear
Barley insecticides	ARDEC, Fort Collins	Reg Koll, Mike Matsuda, Chris Fryrear
Corn rootworm control	ARDEC, Fort Collins	Reg Koll, Mike Matsuda, Chris Fryrear
Western bean cutworm control	ARDEC, Fort Collins	Reg Koll, Mike Matsuda, Chris Fryrear
Corn spider mite control	ARDEC, Fort Collins	Reg Koll, Mike Matsuda, Chris Fryrear
Russian wheat aphid control	ARDEC, Fort Collins	Reg Koll, Mike Matsuda, Chris Fryrear
Pheromone traps	ARDEC, Fort Collins	Reg Koll, Mike Matsuda, Chris Fryrear
Pheromone traps	Briggsdale	Justin Herman, Stan Cass
Suction trap	Briggsdale	Justin Herman, Stan Cass
Suction trap	Akron (Central Great Plains Research Station)	Mike Koch, Merle Vigil
Suction trap	Lamar	John Stulp, Thia Walker
Suction trap	Walsh (Plainsman Research Center)	Deb Harn, Kevin Larson
Light trap	Burlington	Dale Hansen, Linda Hegemann
Light trap	Holyoke	Gary Korte, Curt Lebsack, Linda Hegemann
Light trap	Kirk	Gene Nelson, Linda Hegemann
Light trap	Yuma (Irrigated Research Foundation)	Dale Ebersole, Linda Hegemann

PRODUCT INDEX