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Project Report
2002

2002

Vegetable Crops Entomology Field Research
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Acknowledgments

This report describes pesticide related studies conducted in 2002 on vegetable crops by the Department of Entomology under the direction of J. A. Wyman and J. L. Longridge. The assistance of the following graduate students is gratefully acknowledged: Deana Sexson, Carlos Granadino, and Scott Chapman. We also wish to recognize the important role of our summer hourlies in data collection and plot maintenance.

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2002
Temperature and Rainfall
Hancock, WI

April	Air temperature		Rainfall	**May**	Air temperature		Rainfall
Day	Max.	Min.	(inches)	Max.	Min.	Max.	(inches)
1	35	29	0	1	55	35	0.41
2	33	28	0.16	2	48	28	0
3	35	24	0.21	3	55	34	0
4	32	14	T	4	57	30	0
5	38	16	0	5	68	44	0.13
6	44	26	0	6	69	43	0.25
7	45	33	0.16	7	76	40	0
8	46	34	0.31	8	62	45	0.55
9	55	35	0.28	9	51	41	0
10	54	34	0	10	52	40	0
11	69	42	0	11	61	40	0.51
12	59	33	0.53	12	46	40	0.03
13	66	33	0	13	55	38	0
14	68	50	0.01	14	61	39	0
15	71	49	0.07	15	62	38	0
16	83	62	0	16	74	53	0
17	84	60	0.05	17	64	27	0
18	78	46	0.30	18	54	33	0
19	82	44	0.26	19	53	36	0
20	53	29	0	20	54	32	0
21	52	29	T	21	55	41	0
22	40	29	0.28	22	70	38	0
23	41	35	0	23	74	57	0
24	63	33	0	24	76	39	T
25	65	26	0.32	25	53	38	0.50
26	53	26	0	26	58	38	0.07
27	52	33	0	27	75	54	0
28	42	35	1.18	28	79	50	0.22
29	43	36	0	29	80	61	0.22
30	61	41	0	30	85	59	0
				31	84	54	0
		Total	4.12			Total	2.89

2002
Temperature and Rainfall
Hancock, WI

June	Air temperature		Rainfall	**July**	Air temperature		Rainfall
Day	Max.	Min.	(inches)	Day	Max.	Min.	(inches)
1	89	48	0	1	90	71	0
2	88	43	0	2	89	73	0
3	65	44	1.85	3	87	71	0
4	58	49	0.25	4	85	55	0.04
5	60	49	0.22	5	75	58	0
6	74	46	0	6	76	64	0
7	78	62	0	7	89	64	0
8	79	62	0	8	87	69	0
9	82	64	0	9	84	69	0.78
10	77	66	0	10	87	57	0
11	79	68	2.30	11	76	49	0
12	73	57	0	12	77	53	0
13	69	52	0	13	83	55	0
14	64	49	0.62	14	84	60	0
15	64	45	0.60	15	87	64	0
16	75	48	0	16	85	65	0
17	76	55	0	17	90	67	0
18	79	60	0	18	81	63	0
19	73	63	T	19	84	60	0
20	82	60	0.05	20	83	56	0
21	81	60	0.54	21	84	69	0
22	72	64	9.43	22	97	68	0.53
23	87	64	0.32	23	82	57	0.03
24	86	68	0	24	77	60	0
25	88	64	0	25	78	62	0
26	83	62	0.36	26	75	66	0.48
27	78	62	0	27	87	69	0.01
28	83	63	0	28	82	66	T
29	82	67	0	29	90	62	0.65
30	90	72	0	30	81	65	0.09
				31	85	62	0.55
		Total	16.64			Total	3.16

2002
Temperature and Rainfall
Hancock, WI

August	Air temperature		Rainfall	**September**	Air temperature		Rainfall
Day	Max.	Min.	(inches)	Day	Max.	Min.	(inches)
1	87	52	0	1	35	29	0
2	78	53	0	2	33	28	0.16
3	80	60	0.73	3	35	24	0.21
4	83	61	0	4	32	14	T
5	77	51	0	5	38	16	0
6	70	53	0	6	44	26	0
7	75	56	0	7	45	33	0.16
8	80	58	0	8	46	34	0.31
9	81	59	0	9	55	35	0.28
10	83	59	0	10	54	34	0
11	89	63	0.50	11	69	42	0
12	84	63	0.76	12	59	33	0.53
13	68	57	0.38	13	66	33	0
14	77	58	0	14	68	50	0.01
15	81	58	0	15	71	49	0.07
16	81	65	0.18	16	83	62	0
17	75	51	0	17	84	60	0.05
18	74	50	0.02	18	78	46	0.30
19	74	47	0	19	82	44	0.26
20	77	60	0.08	20	53	29	0
21	77	64	1.28	21	52	29	T
22	71	63	0.03	22	40	29	0.28
23	69	62	0.30	23	41	35	0
24	81	61	0	24	63	33	0
25	80	58	0	25	65	26	0.32
26	82	58	0	26	53	26	0
27	78	60	0	27	52	33	0
28	76	55	0	28	42	35	1.18
29	78	54	0	29	43	36	0
30	80	61	0	30	61	41	0
31	81	61	0				
		Total	4.26			Total	4.07

2002
Temperature and Rainfall
Arlington, WI

April	Air temperature		Rainfall	**May**	Air temperature		Rainfall
Day	Max.	Min.	(inches)	Max.	Min.	Max.	(inches)
1	44	29	0.02	1	56	36	0.50
2	34	25	0.07	2	51	31	T
3	33	23	T	3	55	31	0
4	32	23	0	4	57	31	0
5	39	22	0	5	74	46	0.13
6	45	19	0.76	6	79	49	T
7	45	36	0.29	7	80	43	0
8	47	34	0.50	8	60	48	0.68
9	55	35	0	9	69	40	0
10	62	40	0	10	62	41	0
11	70	45	0	11	56	43	0.62
12	72	46	0	12	56	41	T
13	65	32	0	13	53	40	0
14	72	44	T	14	62	39	0
15	73	57	0	15	63	39	T
16	85	65	T	16	75	57	T
17	78	65	0	17	66	29	0
18	83	48	0.56	18	55	35	0
19	84	44	T	19	53	36	0
20	50	32	T	20	52	32	0
21	50	31	0.25	21	53	38	0
22	39	28	0	22	69	39	0
23	42	34	0	23	72	56	0
24	60	42	0.31	24	72	39	0
25	68	29	0	25	50	41	0.60
26	52	33	0	26	59	43	0.17
27	52	35	0.48	27	77	52	0
28	42	37	T	28	81	50	0.24
29	44	37	0	29	80	59	0
30	60	42	0	30	84	64	0
				31	81	58	0
		Total	3.24			Total	2.94

2002
Temperature and Rainfall
Arlington, WI

June	Air temperature		Rainfall	**July**	Air temperature		Rainfall
Day	Max.	Min.	(inches)	Day	Max.	Min.	(inches)
1	87	55	0	1	92	70	0
2	88	46	1.53	2	89	65	0
3	62	49	0.85	3	88	67	0
4	62	52	0.16	4	86	67	0
5	64	54	0	5	86	55	0
6	72	51	0	6	84	61	0
7	76	60	0	7	89	69	0
8	83	59	0	8	93	73	0.45
9	85	65	0	9	92	70	0
10	86	66	0.93	10	85	60	T
11	78	62	0	11	74	62	0
12	75	55	T	12	79	53	0
13	68	50	0.10	13	82	56	0
14	65	51	0.12	14	84	53	0
15	65	48	0	15	87	64	0
16	76	52	0.10	16	88	62	0
17	75	56	0.22	17	89	66	0
18	81	60	T	18	89	65	0
19	76	65	T	19	81	59	0
20	85	63	T	20	88	57	0.57
21	84	65	0	21	87	69	0.78
22	88	66	0	22	97	69	0.10
23	90	64	0	23	83	53	0
24	89	67	0	24	78	60	T
25	89	64	0.25	25	80	62	1.00
26	83	62	0.06	26	86	66	T
27	79	61	0	27	88	70	0
28	84	62	0	28	90	69	T
29	90	61	0	29	90	63	T
30	93	71	0	30	81	64	0
				31	92	63	0
		Total	4.32			Total	2.9

2002
Temperature and Rainfall
Arlington, WI

August	Air temperature		Rainfall	**September**	Air temperature		Rainfall
Day	Max.	Min.	(inches)	Day	Max.	Min.	(inches)
1	91	71	0	1	85	61	0.78
2	80	54	0	2	82	56	0.04
3	84	53	0.61	3	77	54	0
4	81	67	T	4	82	53	0
5	79	65	0	5	79	53	0
6	73	50	0	6	84	58	0
7	77	53	0	7	89	58	0
8	79	56	0	8	91	67	0
9	84	56	0	9	91	65	0
10	87	61	0	10	78	48	0.16
11	91	67	0.25	11	75	48	0
12	86	65	0.25	12	76	52	0
13	77	59	T	13	78	58	0
14	78	59	0	14	72	48	0.10
15	83	59	T	15	70	44	0
16	82	65	0.33	16	77	51	0
17	79	65	0	17	80	55	T
18	76	54	T	18	78	59	0.39
19	75	56	0	19	81	67	0.14
20	78	48	0	20	72	53	0.02
21	87	66	0.56	21	68	45	T
22	71	64	0.88	22	63	35	0
23	74	64	T	23	67	34	0
24	78	63	0	24	62	38	0
25	80	58	0	25	72	48	0
26	82	59	0	26	74	49	T
27	82	58	0	27	68	39	0
28	79	52	0	28	70	49	0.28
29	78	52	0	29	80	63	0
30	80	58	0	30	84	62	0
31	81	58	0				
		Total	2.88			Total	1.91

SOIL (Arlington, WI)

Soil Type: Plano silt loam

Sand 12%

Silt 70%

Clay 18%

Organic matter 30 tons

pH 6

SOIL (Hancock, WI)

Soil Type: Plainfield sand

Sand 89%

Silt 6%

Clay 5%

Organic matter 0.77%

pH 5.9-6.3

STATISTICAL ANALYSIS PROCEDURE

All data was subjected to two-way analysis of variance without transformation, unless specific transformations are indicated in tables. Mean separation was by Least Significant Difference test at the 5% level of significance. Means are rounded for clarity, and in all tables, means in a column flanked by the same letter are not significantly different.

Section 1. Insect Control on Potatoes

Part 1. Insect Control with Soil Applied Systemic Insecticides

A. Colorado Potato Beetle Control with Soil Insecticides, Hancock

The Colorado potato beetle is the major insect pest of potatoes throughout the Midwestern and eastern growing regions of the United States. Insecticide resistance is widespread in most areas, control with foliar insecticides is often difficult to achieve, and effective registered materials are becoming more limited. Since the mid 1990's soil applied, systemic insecticides for Colorado potato beetle control have been widely used.

Two trials were conducted at the Hancock Experimental Station on a loamy sand soil, which is characteristic of one type of growing condition in which many of Wisconsin's' potatoes are grown, to evaluate Colorado potato beetle control. Trials evaluated: a) registered and experimental insecticide effectiveness of CPB control, b) effect of seed spacing on CPB control.

Potato plots, which were planted on April 25, consisted of 4 20' rows of Russet Burbank variety potatoes, replicated four times in a randomized block experimental design. Rows were planted on 3' centers and 12 inch plant spacing. Treatments were separated by two untreated border rows (Russet Burbank variety) and replicates were separated by 15' alleys.

The following treatments were evaluated:

a) Registered and experimental soil applied systemic insecticides.

Admire 2F was evaluated at 0.20, 0.25, and 0.30 lb. a.i./A as an in furrow spray over fungicide treated seed (Tops MZ at the rate of 12 oz./cwt.). Platinum 2SC was evaluated at 0.08, 0.10, and 0.125 lb. a.i./A as an in furrow spray over fungicide treated seed (Maxim MZ 10.1DS at the rate of 8 oz./cwt.). V10112 20SG (100 and 150 g. a.i./A) was evaluated as a in furrow spray. Genesis 2SC was evaluated at 0.6 fl. oz./cwt. as a seed piece spray in combination with Tops MZ (12 oz./cwt.) and Maxim 4FS (0.08 fl. oz./cwt.). A12607 7.7DS (8 oz./cwt.), A12142 1.7DS (8 oz./cwt.), Cruiser 5FS (0.15 fl. oz./cwt.) in combination with Maxim 4FS (0.08 fl. oz./cwt.), TopsMZ-Gaucho

(6 and 12 oz./cwt.), and L1204 (12 oz./cwt.) were evaluated as seed piece treatments.

b). Seed piece spacing on CPB control.

Genesis 2SC (0.6 fl. oz./cwt.) in combination with Tops MZ 9.75DS (12 oz./cwt.) at 10, 12, 14, 16, 18, and 20 inch plant spacing. Admire 2F (0.20 lb. a.i./A) in combination with Tops MZ 9.75DS (12 oz./cwt.) at 10, 14, and 18 inch plant spacing.

Furrow treatments were applied April 25 to potato seed pieces in open furrows that were then covered by hilling. Insecticides were sprayed over the seed pieces in a 6-8" band using a CO2 pressurized back pack sprayer with a single hollow cone nozzle (TXVS-6) delivering 10 gpa at 30 psi. Seed piece treatments were applied by adding preweighed dry formulation materials to preweighed, cut, suberized potato seed pieces for each replicate in plastic bags. Bags were shaken thoroughly and seed pieces were hand placed (14" spacing) into open furrows and covered by hilling.

CPB populations were surveyed weekly from June 4 through July 31 by counting CPB life stages (adults, egg masses, small and large larvae) on ten plants in the center two rows of each plot. Damage was recorded weekly by estimating percent defoliation of the four treated rows.

Plots were vine killed on August 2 (Reglone 1 pt./A) and a single row from the center two rows (20') was harvested on August 20 and graded for yield. Plot maintenance was per commercial production.

In addition to 600 lbs./A of starter fertilizer (6:24:24) at planting (April 25), plots received a side dress of 350 lbs./A of 21:0:0 on May 28, 375 lbs./A of 34:0:0 on June 12, and 50 lbs./A of 34:0:0 on June 26.

Plots were overhead irrigated with 0.5" water every 2-5 days from plant emergence to vine kill and received a total of 9.14" of irrigation.

Results

a) Registered and experimental soil applied systemic insecticides.

Colorado potato beetle adult numbers (first generation) peaked in May, before insect survey initiation on June 4. Oviposition peaked in the untreated plots on June 10 with 1.9 egg masses per plant (Table 2). Adults continued to infest the plots during early June and few significant differences were detected among plots (Table 1). Egg mass numbers, however, were greatly influenced by systemic insecticide treatments with numbers at significantly lower levels in the treatments.

Small larvae were first detected in the untreated plots on June 10 and numbers peaked at 8.6 larvae per plant on June 17 (Table 3). Large larval populations increased to 23.5 larvae per plant in the untreated plots on June 26 (Table 4) and defoliation had increased to 60-70 percent by July 15 (Table 5). By mid July, second generation CPB adults were infesting the plots and defoliation rapidly reached 100 percent.

CPB control from all treatments was excellent through mid June (50 days after planting) with virtually no small or large larvae found in any treated plot. By June 26, (62 days after planting) small and large larval numbers began to increase throughout the plots with numbers being the highest in the V10112 20SG treatments. Larval feeding in the V10112 20SG treatments resulted in approximately 20 percent defoliation in both treatments by July 3 while the remaining treatments were well below 5 percent defoliation. Small and large larval numbers dramatically increased in all the treated plots on July 3. Larval numbers in combination with emerging second-generation adults resulted in defoliation ratings reaching 90-100 percent in several treatments. On July 27, defoliation ratings were lowest in the Platinum 2SC and A12607 7.7DS treatments.

In general, Platinum 2SC and A12607 7.7DS treatments were the most effective in reducing defoliation but yields were not significantly higher than the Admire treatments (Table 6).

Yields typically reflect the amount of damage from Colorado potato beetle and total yields ranged from 48.9 cwt. per acre in the untreated plots to 159.3 cwt. per acre in the high rate of Admire (0.30 lb. a.i./A) (Table 6). Yields among the treatments were similar except for the V10112 20SG treatments, which were similar to the untreated plots.

b). Seed piece spacing on CPB control.

Population trends in the untreated plots of this experiment paralleled those described for the systemic insecticide study (a) above. Overwintered CPB adult numbers peaked in early June (Table 7) and oviposition peaked at 3.1 egg masses per plant in the untreated plots on June 10 (Table 8). Small larval numbers peaked in the untreated plots on June 17 at 10.9 larvae per plant and large larval numbers peaked a week later (June 26) at 19.2 larvae per plant (Tables 9 and 10). Second generation adult numbers peaked at 4.5 adults per plant in the untreated plots on July 15. Defoliation in the untreated plots progressed from 20 percent on June 26 to total defoliation (100%) on July 27 (Table 11).

Genesis 2SC and Admire 2F at all seed spacings provided excellent larval control through June 26 (62 days after planting) and defoliation was held below 20 percent in many of the treatments through July 8 (74 days after planting). In general Admire 2F performed better than Genesis 2SC on larvae and differences among seed spacings were not significant, however there were numerical differences.

Yields in this trial were very low due to high levels of late season adult pressure in all treatments (Table 12). All treated plots yielded higher than the untreated plots where only 39 cwt./A was harvested. The highest yields were from the Admire 2F/Tops MZ 9.75DS at 14-inch seed spacing. Slightly lower yields were present in the Genesis 2SC/Tops MZ 9.75DS treatments at similar seed spacings. The remaining treatments yields were as to be expected except for the ten-inch seed spacing treatments that yielded low. This is probably due to crowding and defoliation, which reduced size and overall yield.

Table 1. Colorado potato beetle adults sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean adults per 10 plants								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Maxim MZ 10.1DS	8.0	2.5 a	7.0 a	5.0 b-e	1.3 cde	1.8 abc	34.3 a	31.3 abc	33.8 bcd	1.0 f
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.8 abc	1.3 bcd	3.3 cde	3.0 a-e	1.0 bc	1.3 c	12.0 de	21.8 gh	94.3 a
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	1.0 abc	1.0 bcd	6.8 abc	4.3 ab	2.8 a	2.5 bc	16.5 b-e	31.8 b-e	58.0 abc
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	1.0 abc	1.8 bcd	2.0 e	4.8 ab	1.8 abc	5.8 b	11.3 de	48.0 a	77.3 ab
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.5 abc	1.5 bcd	10.3 a	2.8 a-e	2.8 ab	4.5 bc	23.5 a-d	19.0 h	5.8 ef
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 c	1.5 bcd	3.3 cde	6.5 a	1.0 bc	5.3 b	36.3 a-d	31.0 b-e	34.5 cde
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.5 abc	0.3 d	3.0 cde	3.5 a-e	1.5 abc	2.0 bc	13.3 cde	22.8 fgh	35.5 bcd
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	0.5 abc	1.8 bcd	5.3 b-e	4.0 abc	0.5 c	2.3 bc	8.0 e	22.3 fgh	54.0 abc
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.8 abc	2.0 bcd	4.3 b-e	4.0 a-d	0.8 c	2.8 bc	12.0 de	34.8 bc	27.3 cde

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 1. (Continued). Colorado potato beetle adults sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean adults per 10 plants								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
A 12607 7.7DS	8.0	0.3 bc	0.8 bcd	4.3 b-e	3.8 a-d	3.0 a	2.8 bc	22.8 b-e	22.8 fgh	44.5 abc
A 12142 1.7DS	8.0	0.3 bc	0.5 cd	3.8 b-e	3.8 a-d	3.0 a	1.8 bc	14.0 b-e	26.0 efg	37.3 bcd
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.3 bc	1.0 bcd	5.5 bcd	4.3 ab	0.8 c	1.3 c	12.3 de	38.0 b	40.3 bcd
Tops MZ-Gaucho	12.0	2.0 a	1.3 bcd	2.5 de	2.5 b-e	0.8 c	3.8 bc	14.3 b-e	28.3 c-f	30.8 cde
Tops MZ-Gaucho	16.0	0.0 c	1.0 bcd	4.5 b-e	5.5 ab	0.5 c	1.3 c	14.0 b-e	26.5 efg	52.3 abc
LI 204	12.0	0.5 abc	1.3 bcd	4.8 b-e	5.5 ab	1.0 bc	3.0 bc	27.8 a-d	27 d-g	18.5 c-f
V10112 20SG	100 g. a.i./A	1.5 ab	5.3 a	4.5 b-e	1.0 de	0.8 c	4.5 bc	34.3 ab	26.8 d-g	2.5 f
V10112 20SG	150 g. a.i./A	0.0 c	2.8 abc	7.8 ab	3.0 a-e	0.8 c	2.8 bc	28 a-d	4.3 i	7.5 def
Tops MZ 9.75DS	12.0	0.8 abc	3.5 ab	3.0 de	1.0 e	3.3 a	25.8 a	41.5 a	2.0 i	0.8 f

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. Colorado potato beetle egg masses sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean adults per 10 plants								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Maxim MZ 10.1DS	8.0	12.3 a	16.8 a	8.3 a	0.0 c	0.0 c	0.0 b	0.0 b	0.0 e	0.0 b
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.5 b	1.0 cd	1.8 b	1.3 abc	0.3 bc	0.3 a	1.0 ab	0.0 e	0.0 b
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	0.0 b	0.0 d	1.0 b	1.3 abc	0.5 abc	0.3 a	1.0 ab	0.0 e	0.0 b
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	0.0 b	0.0 d	0.8 b	1.0 abc	1.0 abc	0.0 b	0.5 ab	1.0 cd	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.0 b	0.0 d	1.3 b	1.3 abc	0.8 abc	0.0 b	1.5 a	0.3 de	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 b	0.3 d	0.3 b	2.0 ab	1.5 ab	0.0 b	0.8 ab	1.0 cd	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.0 b	0.8 cd	0.3 b	1.5 abc	2.0 a	0.0 b	1.3 ab	1.0 cd	0.0 b
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	0.3 b	0.0 d	0.5 b	2.0 ab	0.5 abc	0.0 b	0.0 b	2.8 a	0.0 b
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.0 b	0.3 d	0.5 b	1.3 abc	1.8 a	0.0 b	0.0 b	1.5 bc	0.0 b

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. (Continued). Colorado potato beetle egg masses sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean egg masses per 10 plants								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
A 12607 7.7DS	8.0	0.0 b	0.0 d	0.5 b	0.8 abc	2.0 a	0.0 b	0.5 ab	0.8 cde	0.8 a
A 12142 1.7DS	8.0	0.0 b	0.0 d	0.5 b	2.3 a	0.5 abc	0.0 b	0.0 b	1.0 cd	0.0 b
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.3 b	0.3 d	0.3 b	2.0 ab	1.5 ab	0.0 b	0.0 b	0.5 de	0.0 b
Tops MZ-Gaucho	12.0	0.0 b	0.0 d	0.3 b	0.8 abc	1.0 abc	0.0 b	0.3 b	0.5 de	0.0 b
Tops MZ-Gaucho	16.0	0.0 b	0.3 d	0.3 b	1.8 ab	0.3 bc	0.0 b	0.3 b	0.0 e	0.0 b
LI 204	12.0	0.0 b	0.0 d	0.0 b	0.5 abc	0.5 abc	0.0 b	1.8 a	2.5 ab	0.0 b
V10112 20SG	100 g. a.i./A	0.0 b	3.8 b	0.8 b	0.0 c	0.5 abc	0.0 b	0.0 b	0.3 de	0.0 b
V10112 20SG	150 g. a.i./A	0.0 b	2.5 bc	0.5 b	0.5 abc	0.8 abc	0.0 b	0.0 b	0.0 e	0.0 b
Tops MZ 9.75DS	12.0	7.3 a	19.8 a	6.8 a	0.5 bc	0.3 bc	0.0 b	0.0 b	0.0 e	0.0 b

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. Colorado potato beetle small larvae sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean larvae per 10 plants								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Maxim MZ 10.1DS	8.0	0.0 a	35.5 a	71.0 a	62.3 ab	21.8 bcd	4.0 abc	0.0 a	0.0 b	0.0 b
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.0 a	0.0 b	0.0 b	2.5 d	2.3 ef	1.0 c	0.5 a	0.0 b	3.0 a
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	0.0 a	0.0 b	0.0 b	1.3 d	5.3 ef	1.8 bc	2.0 a	0.0 b	0.0 b
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	0.0 a	0.0 b	0.0 b	0.5 d	3.8 f	3.3 abc	1.3 a	0.0 b	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.0 a	0.0 b	0.0 b	4.5 d	42.8 a	12.0 a	2.5 a	0.0 b	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 a	0.0 b	0.0 b	7.0 d	12.3 de	8.5 abc	1.8 a	0.0 b	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.0 a	0.0 b	0.0 b	0.0 d	6.5 ef	10.5 ab	2.5 a	0.0 b	0.0 b
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	0.0 a	0.0 b	0.0 b	7.3 d	31.0 abc	5.0 abc	1.3 a	0.0 b	0.0 b
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 b	0.0 b	7.5 d	23.8 a-d	7.5 abc	0.3 a	0.0 b	0.0 b

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. (Continued). Colorado potato beetle small larvae sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean larvae per 10 plants								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
A 12607 7.7DS	8.0	0.0 a	0.0 b	0.0 b	1.5 d	11.8 def	15.3 a	3.5 a	0.0 b	0.0 b
A 12142 1.7DS	8.0	0.0 a	0.0 b	0.0 b	2.3 d	21.8 cd	11.5 ab	5.8 a	0.0 b	0.0 b
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 b	0.0 b	4.0 d	31.5 abc	5.0 abc	0.5 a	0.0 b	0.0 b
Tops MZ-Gaucho	12.0	0.0 a	0.0 b	0.0 b	1.3 d	33.0 abc	8.3 abc	2.5 a	0.0 b	0.0 b
Tops MZ-Gaucho	16.0	0.0 a	0.0 b	0.0 b	1.5 d	10.0 def	6.5 abc	2.5 a	0.0 b	0.0 b
LI 204	12.0	0.0 a	0.0 b	0.0 b	0.8 d	9.0 ef	7.8 abc	0.5 a	0.3 a	0.0 b
V10112 20SG	100 g. a.i./A	0.0 a	0.0 b	0.5 b	72.8 a	29.5 abc	10.3 ab	0.3 a	0.0 b	0.0 b
V10112 20SG	150 g. a.i./A	0.0 a	0.0 b	0.0 b	48.5 bc	35.8 ab	5.3 abc	0.0 a	0.0 b	0.0 b
Tops MZ 9.75DS	12.0	0.0 a	34.3 a	86.5 a	33.8 c	10.0 def	3.0 abc	1.5 a	0.0 b	0.0 b

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. Colorado potato beetle large larvae sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean larvae per 10 plants								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Maxim MZ 10.1DS	8.0	0.0 a	0.0 a	19 a	235 a	71.3 b	34.8 e-h	7.3 e	0.0 d	0.0 a
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 c	0.3 e	5.5 cd	14.8 i	11.3 e	0.0 d	0.0 a
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 c	0.0 e	7 cd	24.3 f-i	22.8 b-e	0.0 d	0.0 a
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 c	0.3 e	2.5 d	12.5 i	19.8 de	1.8 abc	0.0 a
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 c	4.3 e	66.5 b	61.3 a-d	51.8 a	1.3 cd	0.0 a
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 c	0.0 e	18.5 c	21.3 ghi	33.8 a-d	1.5 a-d	0.0 a
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 c	0.0 e	9 cd	13.8 i	33.8 a-d	3.3 ab	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	0.0 a	0.0 a	0.0 c	4.5 e	72.8 b	84.8 a	52.3 a	2 bcd	0.0 a
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 a	0.0 c	4.5 e	62.3 b	52.8 b-e	43.8 ab	1.8 a-d	0.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. (Continued). Colorado potato beetle large larvae sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean larvae per 10 plants								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
A 12607 7.7DS	8.0	0.0 a	0.0 a	0.0 c	0.3 e	5.5 cd	17.3 hi	34.5 a-d	3.8 a	0.0 a
A 12142 1.7DS	8.0	0.0 a	0.0 a	0.0 c	0.0 e	17.5 c	44.5 c-f	50.3 a	0.8 cd	0.0 a
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 a	0.0 c	0.0 e	70.0 b	58.8 a-e	52.8 a	0.0 d	0.0 a
Tops MZ-Gaucho	12.0	0.0 a	0.0 a	0.0 c	0.5 e	54.0 b	67.0 abc	38.3 abc	1.0 cd	0.0 a
Tops MZ-Gaucho	16.0	0.0 a	0.0 a	1.8 c	0.5 e	13.0 cd	40.3 d-g	40.3 abc	0.3 cd	0.0 a
LI 204	12.0	0.0 a	0.0 a	0.0 c	0.0 e	6.3 cd	28.3 f-i	19.5 cde	0.0 d	0.0 a
V10112 20SG	100 g. a.i./A	0.0 a	0.0 a	0.0 c	90.0 c	163.5 a	50.8 cde	23.0 b-e	1.5 bcd	0.0 a
V10112 20SG	150 g. a.i./A	0.0 a	0.0 a	0.0 c	35.8 d	159.5 a	81.5 ab	18.5 cde	0.3 cd	0.0 a
Tops MZ 9.75DS	12.0	0.0 a	0.0 a	10.0 b	173.8 b	69.5 b	35.8 d-g	17.8 de	0.0 d	0.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. Percent defoliation ratings from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean percent defoliation per plot								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Maxim MZ 10.1DS	8.0	0.0 a	0.0 a	1.3 a	16.3 a	45 a	47.5 a	72.5 a	97.5 ab	100.0 a
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	0.0 c	0.0 e	93.8 b	96.3 a
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	0.0 c	2.5 de	85 c	91.3 ab
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	0.0 c	1.3 e	67.5 d	96.3 a
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 b	0.0 c	1.3 c	3.8 c	18.8 cd	30.0 h	100.0 a
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	0.0 c	11.3 cde	30.0 h	93.8 ab
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	0.0 c	1.3 e	6.3 i	96.3 a
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	0.0 a	0.0 a	0.0 b	0.0 c	1.3 c	3.8 c	11.3 cde	40.0 g	93.8 ab
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	2.5 c	11.3 cde	47.5 f	92.5 ab

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. (Continued). Percent defoliation ratings from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean percent defoliation per plot								
		6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
A 12607 7.7DS	8.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	0.0 c	2.5 de	7.5 i	85 b
A 12142 1.7DS	8.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	1.3 c	6.3 cde	50.0 f	96.3 a
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 a	0.0 b	0.0 c	1.3 c	3.8 c	22.5 c	61.3 e	97.5 a
Tops MZ-Gaucho	12.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	6.3 c	12.5 cde	40.0 g	98.8 a
Tops MZ-Gaucho	16.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	0.0 c	5 de	62.5 de	92.5 ab
LI 204	12.0	0.0 a	0.0 a	0.0 b	0.0 c	0.0 c	0.0 c	1.3 e	40.0 g	100.0 a
V10112 20SG	100 g. a.i./A	0.0 a	0.0 a	0.0 b	1.3 c	20.0 b	35 b	50.0 b	45 fg	100.0 a
V10112 20SG	150 g. a.i./A	0.0 a	0.0 a	0.0 b	0.0 c	16.3 b	31.3 b	46.3 b	100.0 a	100.0 a
Tops MZ 9.75DS	12.0	0.0 a	0.0 a	0.0 b	11.3 b	21.3 b	27.5 b	62.5 ab	100.0 a	100.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 6. Yield and grade of Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean percent		Total yield (cwt./A)
		A's	B's and culls	
Maxim MZ 10.1DS	8.0	19.3 g	80.7 a	48.9 e
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	39.1 a-d	60.9 d-g	132.9 ab
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	32.7c-f	67.3 b-e	144.3 ab
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	44.1 a	55.9 g	159.3 a
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	32.5 c-f	67.5 b-e	100.0 cd
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	35.7 a-e	64.3 c-g	125.1 bc
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	38.5 a-e	61.5 c-g	138.4 ab
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	35.4 a-e	64.6 c-g	130.8 b
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	36.5 a-e	63.5 c-g	133.0 ab
A 12607 7.7DS	8.0	33.2 cde	66.8 cde	125.9 bc
A 12142 1.7DS	8.0	31.8 c-f	68.2 b-e	137.1 ab
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	33.4 cde	66.6 cde	117.9 bc

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 6. (Continued). Yield and grade of Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean percent		Total yield (cwt./A)
		A's	B's and culls	
Tops MZ-Gaucho	12.0	43.1 ab	56.9 fg	136.4 ab
Tops MZ-Gaucho	16.0	34.5 b-e	65.5 c-f	127.9 bc
LI 204	12.0	40.3 abc	59.7 efg	127.4 bc
V10112 20SG	100 g. a.i./A	29.9 def	70.1 bcd	72.5 de
V10112 20SG	150 g. a.i./A	29.5 ef	70.5 bc	74.5 de
Tops MZ 9.75DS	12.0	23.7 fg	76.3 ab	51.8 e

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 7. Colorado potato beetle adults sampled from Russet Burbank variety potatoes planted at various seed spacings. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Spacing (inches)	Mean adults per 10 plants								
			6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	10	0.0 b	0.3 c	5.0 bc	5.8 bc	0.5 c	2.3 c	26.3 ab	29.8 bc	11.5 abc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	12	1.0 ab	2.5 bc	4.5 bc	7.0 ab	0.5 bc	4.8 bc	18.5 ab	19.0 d	22.5 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	14	0.8 ab	1.5 bc	7.0 abc	3.8 bc	1.3 abc	4.0 bc	15.5 ab	23.5 cd	11.3 abc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	16	1.0 ab	1.8 bc	4.8 bc	3.5 cd	1.0 abc	3.3 bc	27.8 ab	32.0 b	6.0 bc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	18	1.5 a	3.5 ab	4.8 bc	3.5 cd	1.0 abc	4.3 bc	14.5 b	10.8 e	6.3 abc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	20	0.5 ab	0.8 bc	7.5 abc	6.0 abc	1.0 abc	5.0 bc	25.8 ab	13.3 e	10.5 abc
Admire 2F Tops MZ 9.75DS	13.0 12.0	10	1.0 ab	2.3 bc	8.3 ab	3.8 bc	1.5 ab	2.5 c	37.3 ab	28.5 bc	14.0 abc
Admire 2F Tops MZ 9.75DS	13.0 12.0	14	0.0 b	2.0 bc	7.3 abc	3.8 cd	2.3 abc	7.5 b	37.8 ab	42.5 a	21.8 ab
Admire 2F Tops MZ 9.75DS	13.0 12.0	18	0.0 b	2.3 bc	11.5 a	9.5 a	3.3 a	7.0 b	46.3 a	50.3 a	19.0 ab
Tops MZ 9.75DS	12.0	12	1.0 ab	6.8 a	3.5 c	1.5 d	1.3 abc	45.5 a	25.3 ab	1.8 f	1.5 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 8. Colorado potato beetle egg masses sampled from Russet Burbank variety potatoes planted at various seed spacings. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Spacing (inches)	Mean egg masses per 10 plants								
			6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	10	0.0 b	0.0 b	1.3 a	3.0 ab	0.5 ab	0.8 a	0.5 ab	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	12	0.0 b	0.0 b	1.5 a	2.8 ab	0.3 a	0.3 a	0.3 ab	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	14	0.0 b	0.0 b	2.5 a	3.0 ab	0.0 a	0.3 a	0.5 ab	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	16	0.0 b	0.3 b	3.0 a	3.3 ab	0.3 a	0.0 a	0.0 b	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	18	0.0 b	0.8 b	2.0 a	1.8 bc	0.3 ab	0.5 a	0.0 b	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	20	0.0 b	0.3 b	2.5 a	6.0 a	0.5 b	0.0 a	0.0 b	0.0 a	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	10	0.0 b	0.0 b	2.0 a	1.3 bc	0.8 ab	0.0 a	1.3 a	0.0 a	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	14	0.0 b	0.0 b	1.3 a	1.5 bc	0.0 b	0.5 a	0.3 ab	0.0 a	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	18	0.0 b	1.0 b	2.5 a	1.8 bc	1.0 b	0.5 a	0.0 b	0.0 a	0.0 a
Tops MZ 9.75DS	12.0	12	13.0 a	31.8 a	2.8 a	0.3 c	0.0 b	0.0 a	0.0 b	0.0 a	0.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 9. Colorado potato beetle small larvae sampled from Russet Burbank variety potatoes planted at various seed spacings. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Spacing (inches)	Mean larvae per 10 plants								
			6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	10	0.0 a	0.0 b	0.0 b	4.3 bcd	11.5 a	9.3 a	1.8 a	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	12	0.0 a	0.0 b	0.0 b	0.3 d	16.0 a	9.8 a	0.8 a	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	14	0.0 a	0.0 b	0.0 b	9.5 bcd	6.5 a	10.0 a	0.8 a	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	16	0.0 a	0.0 b	0.0 b	19.3 b	18.5 a	4.5 a	1.5 a	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	18	0.0 a	0.0 b	0.0 b	10.5 bcd	17.8 ab	9.3 a	2.5 a	0.0 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	20	0.0 a	0.0 b	0.0 b	16.3 bc	22.0 ab	9.3 a	0.5 a	0.0 a	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	10	0.0 a	0.0 b	0.0 b	3.8 cd	8.0 abc	2.5 a	0.3 a	0.0 a	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	14	0.0 a	0.0 b	0.0 b	0.3 d	0.5 ab	3.3 a	3.0 a	0.0 a	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	18	0.0 a	1.8 b	0.0 b	0.5 d	4.8 bc	6.3 a	0.0 a	0.0 a	0.0 a
Tops MZ 9.75DS	12.0	12	0 a	42.5 a	109.0 a	66.8 a	0.3 c	6.5 a	0.8 a	0.0 a	0.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 10. Colorado potato beetle large larvae sampled from Russet Burbank variety potatoes planted at various seed spacings. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Spacing (inches)	Mean larvae per 10 plants								
			6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	10	0.0 a	0.0 a	0.0 b	0.5 b	23.8 bcd	59.5 bc	41.5 abc	0.0 b	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	12	0.0 a	0.0 a	0.0 b	0.8 b	22.0 bcd	74.3 abc	52.0 a	0.0 b	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	14	0.0 a	0.0 a	0.0 b	0.8 b	37.5 bcd	46.3 cd	46.3 ab	0.3 a	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	16	0.0 a	0.0 a	0.0 b	3.8 b	47.0 ab	87.0 ab	34.8 a-d	0.0 b	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	18	0.0 a	0.0 a	0.0 b	3.3 b	40.8 a-d	84.3 ab	50.0 ab	0.0 b	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	20	0.0 a	0.0 a	0.0 b	5.3 b	45.0 abc	106.5 a	45.8 ab	0.0 b	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	10	0.0 a	0.0 a	0.0 b	0.0 b	6.3 d	23.8 d	15.5 d	0.0 b	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	14	0.0 a	0.0 a	0.0 b	0.5 b	7.3 a	30.0 d	23.8 bcd	0.0 b	0.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	18	0.0 a	0.0 a	0.0 b	0.0 b	7.3 cd	25.5 d	16.0 cd	0.0 b	0.0 a
Tops MZ 9.75DS	12.0	12	0.0 a	0.0 a	8.3 a	192.0 a	32.8 bcd	20.3 d	19.3 d	0.0 b	0.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 11. Percent defoliation ratings from Russet Burbank variety potatoes planted at various seed spacings. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Spacing (inches)	Mean adults per 10 plants								
			6-4	6-10	6-17	6-26	7-3	7-8	7-15	7-27	7-31
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	10	0.0 a	0.0 a	0.0 a	0.0 b	0.0 b	2.5 c	11.3 cd	96.3 abc	100.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	12	0.0 a	0.0 a	0.0 a	0.0 b	0.0 b	8.8 bc	22.5 c	93.8 c	97.5 b
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	14	0.0 a	0.0 a	0.0 a	0.0 b	0.0 b	3.8 c	11.3 cd	93.8 c	98.8 ab
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	16	0.0 a	0.0 a	0.0 a	0.0 b	0.0 b	15.0 bc	43.8 b	98.8 ab	100.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	18	0.0 a	0.0 a	0.0 a	0.0 b	0.0 b	15.0 bc	45.0 b	97.5 abc	100.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	20	0.0 a	0.0 a	0.0 a	0.0 b	1.3 b	21.3 b	52.5 b	100.0 a	100.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	10	0.0 a	0.0 a	0.0 a	0.0 b	0.0 b	1.3 c	3.8 d	95 bc	100.0 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	14	0.0 a	0.0 a	0.0 a	0.0 b	0.0 b	1.3 c	5.0 cd	93.8 c	98.8 ab
Admire 2F Tops MZ 9.75DS	13.0 12.0	18	0.0 a	0.0 a	0.0 a	0.0 b	0.0 b	0.0 c	11.3 cd	98.8 ab	98.8 ab
Tops MZ 9.75DS	12.0	12	0.0 a	0.0 a	0.0 a	20.0 a	45.0 a	58.8 a	75.0 a	100.0 a	100.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 12. Yield and grade of Russet Burbank variety potatoes planted at various seed spacings. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Spacing (Inches)	Mean percent		Total yield (cwt./A)
			A's	B's and culls	
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	10	32.1 ab	67.9 bc	95.3 bc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	12	29.4 ab	70.6 bc	106.5 abc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	14	31.0 ab	69.0 bc	101.0 bc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	16	25.8 b	74.2 b	86.9 bc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	18	28.8 ab	71.2 bc	86.8 bc
Genesis 2SC Tops MZ 9.75DS	0.6 12.0	20	26.5 b	73.5 b	78.3 c
Admire 2F Tops MZ 9.75DS	13.0 12.0	10	35.9 ab	64.1 bc	103.6 bc
Admire 2F Tops MZ 9.75DS	13.0 12.0	14	32.7 ab	67.3 bc	132.8 a
Admire 2F Tops MZ 9.75DS	13.0 12.0	18	37.8 a	62.2 c	111.1 ab
Tops MZ 9.75DS	12.0	12	14.5 c	85.5 a	39.1 d

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Section 1. Insect Control on Potatoes.

Part 1. Insect Control with Soil Applied Systemic Insecticides.

B. Colorado Potato Beetle Control with Soil Insecticides, Endeavor.

A trial was conducted at Gumz Farms Inc., Endeavor, WI, on a muck soil, which is characteristic of one type of growing condition in which Wisconsin's' potatoes are grown, to evaluate Colorado potato beetle (CPB) control. This trial evaluated registered and experimental systemic insecticide effectiveness of CPB control.

Potato plots, which were planted on June 17, consisted of 4 x 20' rows of Red Norland variety potatoes, replicated four times in a randomized block experimental design. Rows were planted on 3' centers and 12 inch plant spacing.

The following treatments were evaluated:

Admire 2F was evaluated at 16 oz./cwt. of seed. Platinum 2SC was evaluated at 0.45 fl. oz./1000 row feet as an in furrow application over fungicide treated seed (Maxim MZ 10.1DS at the rate of 8 oz./cwt). Genesis 2SC was evaluated at 0.6 fl. oz./cwt. as a seed piece spray in combination with Tops Maxim 4FS (0.08 fl. oz./cwt.). A12142 1.7DS was evaluated at 8 oz./cwt. as a seed piece spray. Cruiser 5FS at 0.15 fl. oz./cwt. in combination with Maxim 4FS at 0.08 fl. oz./cwt. was evaluated as a seed piece spray. TopsMZ-Gaucho (12 oz./cwt.) was evaluated as seed piece treatment.

Furrow treatments were applied June 17 to potato seed pieces in open furrows that were covered by hilling. Insecticides were sprayed over the seed pieces in a 6-8" band using a CO_2 pressurized back pack sprayer with a single hollow cone nozzle (TXVS-6) delivering 10 gpa at 30 psi. Seed piece treatments were applied by adding preweighed, dry formulation materials to preweighed, cut, suberized potato seed pieces for each replicate in plastic bags. Bags were shaken thoroughly and seed pieces were hand placed (14" spacing) into open furrows and covered by hilling.

CPB populations were surveyed weekly from July 12 through August 21 by counting CPB life stages (adults, egg masses, small and large larvae) on ten

plants in the center two rows of each plot. Damage was recorded weekly by estimating percent defoliation of the four treated rows per plot.

Plots were overhead irrigated with 0.5" water every 2-5 days from plant emergence to vine kill. Plots were not harvested for yield.

Results

Colorado potato beetle adult and egg mass numbers were low in the trial during July and first generation numbers peaked before sample initiation on July 12 (Table 1). First generation larval numbers peaked in the untreated plots on July 12 at 2.1 small larvae and 2.4 large larvae per plant (Tables 3 and 4). Second generation adult numbers peaked at 5.3 adults and 1.3 egg masses per 10 plants on August 8. Second generation larval numbers peaked two weeks later (August 21) when 9.5 small larvae and 18.0 large larvae were found per sample in the untreated plots. Defoliation among the plots was low during the season and reflected the light feeding pressure from CPB adults and larvae (Table 5).

Defoliation in the plots was limited to less than fifteen percent among the treatments on the final sample date (August 21). Many of the treatments prevented CPB adults and larvae from defoliating more than five percent of the plants in any plot. However, defoliation in the A12607 7.7DS and Platinum 2SC/Maxim MZ 10.1DS treatments had ratings statistically similar to the untreated plots. CPB larval pressure was consistently highest in these two plots until all the materials lost efficacy 52 days after planting (August 8).

Table 1. Colorado potato beetle adults sampled from Red Norland variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean adults per 10 plants					
		7-12	7-18	7-27	7-30	8-8	8-21
Maxim MZ 10.1DS	8.0	0.0 a	0.3 a	0.5 ab	2.8 a	5.3 ab	3.3 a
A12607 7.7DS	8.0	0.0 a	0.0 a	1.5 a	0.5 ab	9.0 a	2.5 a
Genesis 2SC Maxim MZ 4FS	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.5 a	0.3 ab	0.0 b	2.8 ab	1.3 a
A12142 1.7DS	8.0	0.0 a	1.0 a	1.0 ab	1.8 ab	6.5 ab	1.0 a
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.3 a	0.0 b	0.0 b	6.5 ab	3.8 a
Platinum 2SC Maxim MZ 10.1DS	0.45 fl. oz./1000 row-ft 8.0	0.0 a	0.3 a	0.3 ab	0.5 ab	4.3 ab	2.0 a
Tops MZ-Gaucho 9.75DS	12.0	0.3 a	0.0 a	0.8 ab	0.0 b	1.5 b	1.5 a
Platinum 2SC Maxim MZ 10.1DS	8.0 8.0	0.3 a	0.8 a	0.3 ab	1.3 ab	4.0 ab	1.8 a
Admire 2F	16.0	0.0 a	0.0 a	0.0 b	0.8 ab	2.5 b	1.8 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. Colorado potato beetle egg masses sampled from Red Norland variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean egg masses per 10 plants					
		7-12	7-18	7-27	7-30	8-8	8-21
Maxim MZ 10.1DS	8.0	0.0 a	0.0 b	0.3 a	0.5 a	1.3 a	0.0 a
A12607 7.7DS	8.0	0.0 a	0.0 b	0.3 a	0.0 b	0.5 a	0.8 a
Genesis 2SC Maxim MZ 4FS	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 b	0.0 a	0.0 b	0.3 a	0.3 a
A12142 1.7DS	8.0	0.0 a	0.0 b	0.3 a	0.3 ab	0.5 a	0.0 a
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 b	0.0 a	0.0 b	0.5 a	0.5 a
Platinum 2SC Maxim MZ 10.1DS	0.45 fl. oz./1000 row-ft 8.0	0.0 a	0.0 b	0.3 a	0.0 b	0.5 a	0.0 a
Tops MZ-Gaucho 9.75DS	12.0	0.0 a	0.0 b	0.0 a	0.0 b	0.3 a	0.8 a
Platinum 2SC Maxim MZ 10.1DS	8.0 8.0	0.0 a	0.8 a	0.0 a	0.3 ab	0.0 a	0.8 a
Admire 2F	16.0	0.0 a	0.3 ab	0.0 a	0.0 b	0.8 a	0.3 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. Colorado potato beetle small larvae sampled from Red Norland variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean larvae per 10 plants					
		7-12	7-18	7-27	7-30	8-8	8-21
Maxim MZ 10.1DS	8.0	21.0 a	4.5 ab	3.8 a	0.0 b	1.3 a	9.5 a
A12607 7.7DS	8.0	0.0 b	0.0 b	0.0 a	0.0 b	2.5 a	26.0 a
Genesis 2SC Maxim MZ 4FS	0.6 fl. oz./A 0.08 fl. oz./A	9.3 ab	0.0 b	0.0 a	0.0 b	1.5 a	26.0 a
A12142 1.7DS	8.0	0.0 b	14.0 a	0 a	0.8 ab	0.0 a	10.0 a
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 b	0.0 b	0.0 a	0.5 ab	1.8 a	22.5 a
Platinum 2SC Maxim MZ 10.1DS	0.45 fl. oz./1000 row-ft 8.0	0.0 b	2.8 b	3.8 a	5.5 a	0.5 a	21.0 a
Tops MZ-Gaucho 9.75DS	12.0	0.0 b	0.0 b	0.0 a	0.0 b	0.0 a	10.0 a
Platinum 2SC Maxim MZ 10.1DS	8.0 8.0	0.0 b	0.0 b	0.0 a	4.3 ab	0.0 a	21.0 a
Admire 2F	16.0	0.0 b	0.0 b	0.0 a	0.0 b	1.3 a	10.5 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. Colorado potato beetle large larvae sampled from Red Norland variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean larvae per 10 plants					
		7-12	7-18	7-27	7-30	8-8	8-21
Maxim MZ 10.1DS	8.0	24.3 a	21.0 b	11.3 a	6.0 a	3.0 a	18.0 bc
A12607 7.7DS	8.0	0.0 b	0.0 b	0.0 b	0.0 a	0.8 a	29.0 ab
Genesis 2SC Maxim MZ 4FS	0.6 fl. oz./A 0.08 fl. oz./A	0.0 b	0.0 b	0.0 b	0.0 a	0.5 a	23.8 abc
A12142 1.7DS	8.0	0.0 b	28.5 a	11.5 a	1.8 a	3.3 a	13.3 bc
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 b	0.0 b	0.0 b	1.8 a	1.3 a	15.3 bc
Platinum 2SC Maxim MZ 10.1DS	0.45 fl. oz./1000 row-ft 8.0	0.0 b	7.8 b	10.3 a	6.0 a	3.0 a	13.5 bc
Tops MZ-Gaucho 9.75DS	12.0	0.0 b	0.0 b	0.0 b	0.0 a	0.0 a	9.5 c
Platinum 2SC Maxim MZ 10.1DS	8.0 8.0	0.0 b	0.3 b	0.0 b	1.0 a	2.0 a	40.0 a
Admire 2F	16.0	0.0 b	0.0 b	0.0 b	1.3 a	0.0 a	8.5 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. Percent defoliation of Red Norland variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean defoliation per plot					
		7-12	7-18	7-27	7-30	8-8	8-21
Maxim MZ 10.1DS	8.0	0.0 a	2.5 ab	3.8 a	3.8 a	0.0 b	12.5 a
A12607 7.7DS	8.0	0.0 a	0.0 c	0.0 c	0.0 b	0.0 b	6.3 abc
Genesis 2SC Maxim MZ 4FS	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 c	0.0 c	0.0 b	0.0 b	2.5 c
A12142 1.7DS	8.0	0.0 a	0.0 a	2.5 ab	2.5 a	5.0 a	3.8 bc
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 c	0.0 c	0.0 b	0.0 b	3.8 bc
Platinum 2SC Maxim MZ 10.1DS	0.45 fl. oz./1000 row-ft 8.0	0.0 a	0 abc	1.3 bc	2.5 a	2.5 ab	10.0 ab
Tops MZ-Gaucho 9.75DS	12.0	0.0 a	0.0 c	0.0 c	0.0 b	0.0 b	2.5 c
Platinum 2SC Maxim MZ 10.1DS	8.0 8.0	0.0 a	0.0 bc	0.0 c	0.0 b	2.5 ab	2.5 c
Admire 2F	16.0	0.0 a	0.0 c	0.0 c	0.0 b	0.0 b	1.3 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Section 1. Insect Control on Potatoes

Part 1. Insect Control with Soil Applied Systemic Insecticides

C. Potato Leafhopper Control with Soil Insecticides, Hancock

The potato leafhopper migrates into Wisconsin each year from the southeastern U.S. and causes damage in both the adult and nymphal stages by disrupting the plants ability to translocate photosynthates from the leaves, while feeding on the plant sap. The resultant hopper burn can cause serious yield loss in potatoes. Control options for this insect are limited since both cultural and biological controls are not effective and growers must rely on insecticidal control when populations exceed damage thresholds.

A trial was conducted at the Hancock Experimental Station on a loamy sand soil, which is characteristic of one type of growing condition in which many of Wisconsin's potatoes are grown, to evaluate systemic insecticide control on potato leafhopper.

Potato plots, which were planted on May 9, consisted of 4 20' rows of Russet Burbank variety potatoes, replicated four times in a randomized block experimental design. Rows were planted on 3' centers and 12 inch plant spacing. Treatments were separated by two untreated border rows (Russet Burbank variety) and replicates were separated by 15' alleys.

The following treatments were evaluated:

a) Registered and experimental soil applied systemic insecticides.

Admire 2F was evaluated at 0.20, 0.25, and 0.30 lb. a.i./A as an in furrow spray over fungicide treated seed (Tops MZ at the rate of 12 oz./cwt.). Platinum 2SC was evaluated at 0.08, 0.10, and 0.125 lb. a.i./A as an in furrow spray over fungicide treated seed (Maxim MZ 10.1DS at the rate of 8 oz./cwt.). V10112 20SG (100 and 150 g. a.i./A) was evaluated as a in furrow spray. Genesis 2SC was evaluated at 0.6 fl. oz./cwt. as a seed piece spray in combination with Tops MZ (12 oz./cwt.) and Maxim 4FS (0.08 fl. oz./cwt.). A12607 7.7DS (8 oz./cwt.), A12142 1.7DS (8 oz./cwt.), Cruiser 5FS (0.15 fl. oz./cwt.) in combination with Maxim 4FS (0.08 fl. oz./cwt.), TopsMZ-Gaucho

(6 and 12 oz./cwt.), and L1204 (12 oz./cwt.) were evaluated as seed piece treatments.

Furrow treatments were applied May 9 to potato seed pieces in open furrows that were then covered by hilling. Insecticides were sprayed over the seed pieces in a 6-8" band using a CO2 pressurized back pack sprayer with a single hollow cone nozzle (TXVS-6) delivering 10 gpa at 30 psi. Seed piece treatments were applied by adding preweighed dry formulation materials to preweighed, cut, suberized potato seed pieces for each replicate in plastic bags. Bags were shaken thoroughly and seed pieces were hand placed (14" spacing) into open furrows and covered by hilling.

Potato leafhopper populations were surveyed weekly from June 14 through July 25 by counting potato leafhopper adults (25 sweeps per plot) and nymphs (20 leaves per plot) from the center two rows of each plot.

Plots were vine killed on August 2 (Reglone 1 pt./A) and a single row from the center two rows (20') was harvested on August 20 and graded for yield. Plot maintenance was per commercial production.

Plots were overhead irrigated with 0.5" water every 2-5 days from plant emergence to vine kill and received a total of 9.14" of irrigation.

Results

Potato leafhopper adult and nymph numbers were low during June and July and peaked in the untreated plots at 0.4 adults per sweep and 1.5 nymphs per leaf on July 19 (Tables 1 and 2). Potato leafhopper adults are very mobile and this is reflected in the numbers of adults among the plots. None of the treatments prevented adult infestation and numbers were similar among treatments. Potato leafhopper nymph numbers did not peak in the untreated plots until the middle of July. All the materials evaluated had nymphal numbers at significantly lower levels than the untreated plots.

In general, Thiomethoxam (Platinum and Cruiser) provided the best nymphal control while imidacloprid also provided good control.

Yields ranged from 23.2 cwt. per acre in the untreated plots to 133.8 cwt. per acre in the LI 204 (12 oz/cwt.) (Table 5). Yields among the treatments were similar except for the V10112 20SG treatments, which were similar to the untreated plots.

Table 1. Potato leafhopper adults sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean adults per 15 sweeps				
		6-14	6-25	7-02	7-11	7-19
Maxim MZ 10.1DS	8.0	0.0 b	6.0 a	7.8 a	8.5 bcd	10.0 a-d
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.0 b	4.3 a-d	6.0 ab	10.3 a-d	11.0 a-d
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	0.5 ab	2.8 bcd	5.3 abc	11.8 abc	18.8 a
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	0.5 ab	2.0 cd	4.8 bc	10.0 a-d	5.8 cd
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.3 ab	4.0 a-d	5.3 bc	6.8 cd	4.8 d
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 b	4.3 abc	4.5 bc	6.5 cd	5.5 d
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.0 b	3.0 bcd	4.5 bc	8.3 bcd	8.5 a-d
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	0.3 ab	2.5 cd	5.0 abc	15.0 ab	17.3 abc
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.5 ab	3.3 a-d	6.5 ab	10.5 a-d	15.8 ab

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 1. (Continued). Potato leafhopper adults sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean adults per 15 sweeps				
		6-14	6-25	7-02	7-11	7-19
A 12607 7.7DS	8.0	0.3 ab	1.8 d	5.8 abc	7.0 cd	9.0 a-d
A 12142 1.7DS	8.0	0.0 b	3.5 a-d	4.5 bc	7.8 cd	7.3 bcd
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.3 ab	3.5 a-d	6 ab	7.8 bcd	6.5 bcd
Tops MZ-Gaucho	12.0	0.3 ab	4.0 a-d	4.5 bc	17.0 a	18.8 a
Tops MZ-Gaucho	16.0	0.0 b	1.8 cd	4.8 bc	15.3 ab	18.5 a
LI 204	12.0	0.3 ab	3.3 a-d	3.3 c	6.0 cd	9.8 a-d
V10112 20SG	100 g. a.i./A	0.3 ab	5.5 ab	5.5 abc	8.5 bcd	13.3 a-d
V10112 20SG	150 g. a.i./A	0.0 b	5.8 ab	5.8 ab	5.5 d	11.0 a-d
Tops MZ 9.75DS	12.0	0.8 a	6.8 ab	6.5 ab	12.3 abc	8.8 bcd

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. Potato leafhopper nymphs sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean nymphs per 15 leaves				
		6-14	6-25	7-02	7-11	7-19
Maxim MZ 10.1DS	8.0	0.0 a	0.0 a	7.0 a	14.5 b	29.5 a
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 c	0.8 c	1.0 bc
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 c	0.0 c	0.5 c
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	0.0 a	0.0 a	0.0 c	1.3 c	1.0 bc
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 c	0.8 c	3.3 bc
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 c	0.3 c	0.8 c
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.0 a	0.0 a	0.0 c	0.0 c	0.3 c
Genesis 2SC Tops MZ 9.75DS	0.0.6 fl. oz./A 12.0	0.0 a	0.0 a	0.0 c	3.3 c	3.3 bc
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 a	0.0 c	3.0 c	8.0 bc

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. (Continued). Potato leafhopper nymphs sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean nymphs per 15 leaves				
		6-14	6-25	7-02	7-11	7-19
A 12607 7.7DS	8.0	0.0 a	0.0 a	0.0 c	3.5 c	0.0 c
A 12142 1.7DS	8.0	0.0 a	0.0 a	0.0 c	0.5 c	2.0 bc
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 a	0.0 c	0.5 c	0.3 c
Tops MZ-Gaucho	12.0	0.0 a	0.0 a	0.3 c	1.3 c	4.5 bc
Tops MZ-Gaucho	16.0	0.0 a	0.0 a	0.0 c	0.3 c	6.3 bc
LI 204	12.0	0.0 a	0.8 a	0.0 c	0.5 c	1.3 bc
V10112 20SG	100 g. a.i./A	0.0 a	0.8 a	2.5 b	9.8 b	9 bc
V10112 20SG	150 g. a.i./A	0.0 a	0.0.3 a	0.0 c	14.8 b	11.5 b
Tops MZ 9.75DS	12.0	0.0 a	0.5 a	6.8 a	26.5 a	30.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. Green peach aphids sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean aphids per 20 leaves				
		6-14	6-25	7-02	7-11	7-19
Maxim MZ 10.1DS	8.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	0.0 a	1.3 ab	0.0 b	0.3 a	0.0 a
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.0 a	0.3 ab	0.0 b	0.0 b	0.0 a
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.0 a	0.3 ab	0.0 b	0.0 b	0.0 a
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.8 ab	1.0 a	0.0 b	0.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. (Continued). Green peach aphids sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean aphids per 20 leaves				
		6-14	6-25	7-02	7-11	7-19
A 12607 7.7DS	8.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
A 12142 1.7DS	8.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
Tops MZ-Gaucho	12.0	0.0 a	0.3 ab	0.0 b	0.0 b	0.0 a
Tops MZ-Gaucho	16.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
LI 204	12.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
V10112 20SG	100 g. a.i./A	0.0 a	2.5 a	0.5 ab	0.0 b	0.0 a
V10112 20SG	150 g. a.i./A	0.0 a	0.0 b	0.0 b	0.0 b	0.0 a
Tops MZ 9.75DS	12.0	0.0 a	0.3 ab	0.3 ab	0.0 b	0.0 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. Potato aphids sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean aphids per 20 leaves				
		6-14	6-25	7-02	7-11	7-19
Maxim MZ 10.1DS	8.0	0.0 a	0.0 b	0.3 b	0.5 a	0.0 b
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	0.0 a	0.0 b	0.0 b	0.3 ab	0.0 b
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 b
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 b
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 b
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	0.0 a	0.0 b	0.3 b	0.3 ab	0.0 b
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 b	0.0 b	0.0 b	0.0 b

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. (Continued). Potato aphids sampled from Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean aphids per 20 leaves				
		6-14	6-25	7-02	7-11	7-19
A 12607 7.7DS	8.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 b
A 12142 1.7DS	8.0	0.0 a	0.0 b	0.0 b	0.3 ab	0.8 a
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	0.0 a	0.0 b	0.0 b	0.3 ab	0.0 b
Tops MZ-Gaucho	12.0	0.0 a	0.0 b	0.0 b	0.3 ab	0.0 b
Tops MZ-Gaucho	16.0	0.0 a	0.0 b	0.0 b	0.0 b	0.0 b
LI 204	12.0	0.0 a	0.0 b	0.0 b	0.3 ab	0.0 b
V10112 20SG	100 g. a.i./A	0.0 a	0.3 a	1.5 a	0.0 b	0.5 ab
V10112 20SG	150 g. a.i./A	0.0 a	0.0 b	0.0 b	0.3 ab	0.0 b
Tops MZ 9.75DS	12.0	0.0 a	0.0 b	0.5 ab	0.0 b	0.0 b

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. Yield and grade of Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean percent		Total yield (cwt./A)
		A's	B's and culls	
Maxim MZ 10.1DS	8.0	8.1 g	91.9 a	23.2 g
Admire 2F Tops MZ 9.75DS	0.20 lb. a.i./A 12.0	45.0 abc	55.0 efg	109.0 abc
Admire 2F Tops MZ 9.75DS	0.25 lb. a.i./A 12.0	50.6 a	49.4 g	115.9 abc
Admire 2F Tops MZ 9.75DS	0.30 lb. a.i./A 12.0	49.3 ab	50.7 fg	137.1 a
Platinum 2SC Maxim MZ 10.1DS	0.08 lb. a.i./A 8.0	35.5 bcd	64.5 def	78.7 de
Platinum 2SC Maxim MZ 10.1DS	0.10 lb. a.i./A 8.0	39.1 a-d	60.9 d-g	109.3 abc
Platinum 2SC Maxim MZ 10.1DS	0.125 lb. a.i./A 8.0	39.9 a-d	60.1 d-g	95.6 cde
Genesis 2SC Tops MZ 9.75DS	0.6 fl. oz./A 12.0	29.0 def	71.0 bcd	106.0 bcd
Genesis 2SC Maxim MZ	0.6 fl. oz./A 0.08 fl. oz./A	35.1 bcd	64.9 def	106.2 bcd
A 12607 7.7DS	8.0	40.6 a-d	59.4 d-g	123.3 abc
A 12142 1.7DS	8.0	30.6 c-f	69.4 b-e	123.2 abc
Cruiser 5FS Maxim MZ 4FS	0.15 fl. oz./A 0.08 fl. oz./A	33.6 cde	66.4 cde	113.8 abc

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. (Continued). Yield and grade of Russet Burbank variety potatoes treated with systemic insecticides. Hancock, WI 2002.

Treatment	Rate (oz./cwt.)	Mean percent		Total yield (cwt./A)
		A's	B's and culls	
Tops MZ-Gaucho	12.0	44.3 abc	55.7 efg	117.9 abc
Tops MZ-Gaucho	16.0	49.3 ab	50.7 fg	111.9 abc
LI 204	12.0	49.5 ab	50.5 fg	133.8 ab
V10112 20SG	100 g. a.i./A	19.9 efg	80.1 abc	67.9 ef
V10112 20SG	150 g. a.i./A	18.1 fg	81.9 ab	48.6 fg
Tops MZ 9.75DS	12.0	14.3 g	85.7 a	30.4 g

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Part 2. Insect Control with Foliar Insecticides.

A. General Insect Control with Conventional Insecticides, Arlington 2002.

Potato leafhoppers are considered a key insect pest on potatoes in Wisconsin from early June through August. Adult leafhoppers migrate into Wisconsin on strong southerly winds during late May and early June. After oviposition, eggs hatch within 7-9 days depending on climate and leafhopper nymphs undergo five nymphal stages, each lasting approximately 4-6 days. Potato leafhoppers have few parasitoids and due to their mobility they can be difficult to manage. In Wisconsin the use of insecticides has been the best option to reduce leafhopper populations.

A trial in 2002 was established at the Entomology Experimental Station at Arlington, Wisconsin to evaluate potato leafhopper control with registered and experimental foliar insecticides.

Potato Leafhopper Control with Conventional Insecticides, Arlington 2002.

Experimental foliar insecticides along with currently registered compounds were evaluated for effectiveness in controlling potato leafhopper adults and nymphs while also investigating effects on tarnished plant bugs, potato flea beetles and aphids.

Plots consisting of two 50’ rows of Superior variety potatoes, planted on 36-inch rows, in four replicates were planted on April 30 in a randomized complete block experimental design. All plots were separated by 9’ of cultivated alleyway and replicates were 15’ apart. Matrix (rimsulfuron) at the rate of 1-ounce product per acre and Lexone (metribuzin) at the rate of 0.5 pounds product per acre were applied on May 10 for weed control. Plots were also hand weeded as necessary to maintain weed control. Mtrak (Btt) at the rate of 2 quarts product per acre was applied for CPB larval suppression on June 24. Dithane (mancozeb) at the rate of 2 pounds product per acre was applied for disease control on July 16 and Bravo (chlorthalonil) at the rate of 1-pint product per acre was applied on July 24.

Eleven registered and six experimental insecticides were evaluated and applied at the following rates.

Synthetic pyrethroids-registered:

Asana 0.66E (5.8 fl. oz./A); Baythroid 2EC (0.83 and 1.22 fl. oz./A); Pounce 2E (0.10 lb. a.i. /A); Mustang 1.5EC (0.05 lb. a.i./A); Warrior 1CS (0.02, 0.025, and 0.030 lb. a.i./A).

Synthetic pyrethroids-experimental:

Capture 2E (0.025 lb. a.i./A); FO 570 0.8EW (0.018 lb. a.i./A); F 1785 50DF (0.036, 0.053, and 0.071 lb. a.i./A).

Organophosphates-registered:

Thiodan 3EC (0.75 lb. a.i./A); Dimethoate 4EC (1 pint product per acre).

Others-registered:

Provado 1.6SC (3.76 fl. oz./A); Provado 75WG (1 oz./A); Leverage 2.7E (3.75 fl. oz./A); Actara 25WG (1.5 and 3.0 oz/A).

Others-experimental:

Confidor 200SL (3.6 fl. oz./A); Calypso 4SC (1.5 and 3.0 fl. oz./A); YRC 2894 240SL (2.3 and 3.0 fl. oz./A).

Three foliar applications (June 25, July 2 and 29) were required to maintain leafhopper adult populations below threshold levels in the plots. All the materials were applied on June 25 but only treatments 1-7, 11-13, and 19-22 were applied on July 2 while all the treatments except 20-22 were applied on July 29.

All materials were applied with a tractor-mounted compressed air, boom sprayer operating at 40 psi delivering 22 gpa through five hollow cone nozzles (XR8002 flat fan) spaced at 18”.

Plots were evaluated at 3, 6, 10, 13, 16, 20, 29, and 31 days after the first application (June 25), at 3, 6, 9, and 22 days after the second application (July 2), and 2 and 9 days after the final application on July 29. Pest insects were sampled using conventional sweep net techniques (25 sweeps per plot). Sweep

net samples consisted of 25 sweeps taken from the two rows of each plot. The collected insects were immobilized with chloroform and counted.

The crop was vine killed on August 8 with Reglone (diquat) at the rate of 2 pints per acre tank mixed with X77 at 8 ounces product per 100 gallons of water and harvested for yield and grade on September 7.

RESULTS

Potato leafhopper pressure was high in the plots during the season and adult numbers reached threshold levels on June 24, with an average of 0.8 adults per sweep and several individual samples of greater than 1 adult per sweep. Adult populations were well above threshold levels in the untreated plots from July 5 until July 24.

Adult numbers in the untreated plots were 0.6 adults per sweep after the first insecticide application on June 16 and numbers steadily increased during early July until they peaked at 5.4 adults per sweep on July 15 (Table 1).

At three days post application (June 28) adult numbers were significantly reduced in many of the treated plots (Table 1). The pyrethroids, except for F1785, effectively reduced leafhopper adult numbers and numbers ranged from 0.0 to 1.5 adults per 25 sweeps. F1785 provided little control of leafhopper adults and numbers were often well above threshold levels. The organophosphates, dimethoate and Thiodan effectively reduced leafhopper adult numbers after the first application but were not as effective as the pyrethroids. The neonicotinyl insecticides also effectively reduced leafhopper adult numbers but were not as effective as the pyrethroid or the organophosphate insecticides.

Six days after application (July 1) adult numbers were increasing in all the plots but the pyrethroid treatments were still controlling leafhopper populations. The second application of organophosphates and neonicotinyls on July 2 again reduced leafhopper adult numbers but by July 8 adult numbers were again increasing. Leafhopper adult numbers continued to slowly increase in the plots and peaked in many of the treated plots on July 24. Insecticide applications on July 29 significantly reduced leafhopper adult numbers in all the plots.

Potato leafhopper nymph numbers were at high levels in the untreated plots from mid to late July and peaked at 2.3 nymphs per sweep and 6 nymphs per leaf on July 11 (Table 2). Leafhopper nymph numbers steadily declined in the untreated plots until the vines were dead on August 6. Most of the treatments provided effective nymphal control, however Pounce and to a greater degree F1785 were not as effective as the other materials.

Total aphid counts were taken with green peach and potato aphids being the dominant species (Table 3). Aphid populations were at very low levels during the season. Numbers were actually highest in several of the pyrethroid treatments during late July and early August. With aphid numbers at such low levels determining differences among treatments is difficult when comparisons are being made between 1 and 2 aphids per 25 sweeps.

Flea beetle adult numbers were at low levels until the end of July when numbers reached approximately 1 adult per sweep on July 24 (Table 4). Flea beetle adult numbers peaked in the plots 29 days after insecticide applications on June 24 but crashed prior to the second insecticide application on July 31. Determination of insecticide efficacy in this situation is limited to residual affects of the insecticides and those are questionable since the flea beetle adults may have been attracted to the healthier plants in the better leafhopper treatments.

Tarnished plant bug populations were at very low levels during the season and did not exceed 2.5 adults per sweep in the untreated plots (Table 5).

Growing conditions in 2002 were dryer and warmer than normal but all treatments yielded higher than the untreated plots and few significant differences were detected among treatments (Table 6).

Table 1. Potato leafhopper adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Provado 1.6 SC	3.76 fl oz/A	16.0 a	26.0 ab	7.3 efg	15.8 e-i	18.3 cde	29.3 efg	28.3 bcd	4.5 b	2.5 c-g
Provado 75 WG	1.0 oz/A	8.0 bc	23.8 ab	5.8 fg	17.3 e-h	17.0 c-f	25.8 f-j	27.3 bcd	2.5 b-f	3.5 b-e
Confidor 200 SL	3.6 fl oz/A	6.3 bcd	20.5 a-d	4.8 gh	13.3 f-k	14.5 d-h	29.8 efg	28.0 bcd	1.5 b-h	1.0 fgh
Calypso 4 SC	1.5 fl oz/A	6 b-e	15.5 c-f	10.0 de	8.5 j-m	6.8 jk	19.5 h-k	30.8 bc	2.0 b-g	3.0 b-f
Calypso 4 SC	3.0 fl oz/A	8.8 b	13.3 d-g	10.0 de	7.3 lm	4.5 k	21.5 g-k	25.0 b-e	1.5 b-h	1.0 fgh
YRC 2894 240 SL	2.3 fl oz/A	7.8 bc	28.0 a	8.3 ef	14.5 f-j	14.0 d-i	27 f-i	35.0 ab	1.5 b-h	2.8 b-g
YRC 2894 240 SL	3.0 fl oz/A	6.3 bcd	23 abc	8.3 ef	8.0 klm	13.3 d-i	28.0 e-h	27.5 bcd	3.0 bcd	1.3 fgh
Baythroid 2 E	0.83 fl oz/A	1.0 fg	1.0 h	2.0 i	9.3 i-m	8.3 h-k	18.8 ijk	16.8 def	0.0 h	0.8 gh
Baythroid 2 E	1.22 fl oz/A	1.5 efg	0.8 h	0.5 jk	2.3 n	6.8 jk	24.0 f-k	14.8 ef	0.0 h	1.8 d-h

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 1. (Continued). Potato leafhopper adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Leverage 2.7 E	3.75 fl oz/A	0.0 g	1.5 h	1.8 ij	6.8 lm	7.0 jk	19.3 ijk	18.5 c-f	0.0 h	0.5 h
Actara 25 WG	1.5 oz/A	4.5 b-f	12.0 efg	5.3 g	13.3 f-k	5.8 k	17.5 jk	23.3 b-f	2.5 b-f	1.8 d-h
Actara 25 WG	3.0 fl oz/A	4.5 b-f	9.3 g	2.8 hi	19.3 ef	7.8 h-k	10.3 l	12.5 f	2.3 b-f	1.5 fgh
Dimethoate 4 E	1.0 pint/A	2.3 d-g	11.5 fg	5.5 fg	9.8 i-m	11.0 f-k	29.3 efg	26.8 bcd	0.5 e-h	4.3 a-d
Asana 0.66 EC	5.8 fl oz/A	0.0 g	1.8 h	4.8 gh	11.5 g-l	16.0 d-g	33.0 ef	26.0 bcd	0.0 h	0.3 h
Pounce 3.2 EC	0.1 lb ai/A	1.5 efg	2.8 h	14.3 c	30.8 cd	28.5 b	86.3 b	29.3 bcd	0.3 gh	1.5 fgh
Warrior 1 CS	0.02 lb ai/A	0.3 g	1.5 h	5.5 g	18.5 efg	18.0 cde	23.5 f-k	34.3 ab	0.5 fgh	0.0 h
Warrior 1 CS	0.025 lb ai/A	0.8 g	1.5 h	7.0 efg	7.3 lm	13.8 d-i	28.8 efg	20.5 c-f	0.5 fgh	1.5 e-h
Warrior 1 CS	0.030 lb ai/A	0.8 g	1.3 h	2.5 i	11.0 h-l	13.0 e-j	17.8 k	22.5 b-f	0.0 h	0.0 h

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 1. (Continued). Potato leafhopper adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Thiodan 3 EC	0.75 lb ai/A	2.8 c-g	12.8 efg	15.8 c	23.5 de	23.3 bcd	68.3 c	18.8 c-f	2.5 b-e	1.0 gh
F 1785 50 DF	0.036 lb ai/A	11.0 ab	25.5 ab	35.0 b	48.5 b	28.8 b	77.3 bc	53.0 a	4.0 bc	7.3 a
F 1785 50 DF	0.053 lb ai/A	9.8 b	18.3 b-e	13.8 cd	36.3 c	19.8 b-e	75.0 bc	50.0 a	1.3 d-h	4.8 abc
F 1785 50 DF	0.071 lb ai/A	8.5 b	23.0 abc	14.8 c	38.8 bc	24.8 bc	52.3 d	45.0 a	8.0 a	5.5 ab
Mustang 1.5 EC	0.05 lb ai/A	0.5 g	0.5 h	0.3 k	6.3 lmn	7.5 ijk	22.3 g-k	18.0 c-f	0.3 gh	0.0 h
FO 570 0.8 EW	0.018 lb ai/A	0.0 g	1.5 h	2.0 i	5.3 mn	8.5 g-k	38.5 e	21.3 c-f	0.0 h	0.5 h
Capture 2 E	0.025 lb ai/A	0.3 g	2.3 h	6.5 fg	20.3 ef	15.0 d-g	26.8 f-i	17.3 def	0.0 h	1.0 gh
Untreated	---	15.5 a	21.0 abc	51.0 a	86.0 a	66.5 a	118.3 a	50.0 a	1.3 c-h	DEAD

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. Potato leafhopper nymphs sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean nymphs per 25 leaves	Mean nymphs per 25 sweeps				
		7-11	7-11	7-15	7-24	7-31	8-6
Provado 1.6 SC	3.76 fl oz/A	3.5 d	1.0 de	1.3 fgh	1.3 de	0.3 c	0.8 c
Provado 75 WG	1 oz/A	0.5 d	0.3 e	0.8 gh	1.0 de	0.3 c	0.0 c
Confidor 200 SL	3.6 fl oz/A	2.8 d	0.5 e	1.0 gh	1.0 de	0.3 c	0.0 c
Calypso 4 SC	1.5 fl oz/A	3.0 d	0.8 de	1.3 fgh	1.5 de	0.0 c	0.0 c
Calypso 4 SC	3 fl oz/A	0.3 d	1.0 de	0.3 gh	0.8 de	0.0 c	0.0 c
YRC 2894 240 SL	2.3 fl oz/A	2.0 d	1.0 de	3.3 ef	2.3 de	0.0 c	0.0 c
YRC 2894 240 SL	3 fl oz/A	4.0 d	0.5 e	0.8 gh	0.3 e	0.0 c	0.3 c
Baythroid 2 E	0.83 fl oz/A	2.0 d	1.3 de	0.3 gh	0.0 e	0.0 c	0.8 c
Baythroid 2 E	1.22 fl oz/A	1.3 d	0.5 e	0.8 gh	0.0 e	0.0 c	0.0 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. (Continued). Potato leafhopper nymphs sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean nymphs per 25 leaves	Mean nymphs per 25 sweeps				
		7-11	7-11	7-15	7-24	7-31	8-6
Leverage 2.7 E	3.75 fl oz/A	0.3 d	0.5 e	0.8 gh	0.3 e	0.0 c	0.0 c
Actara 25 WG	1.5 oz/A	0.8 d	0.3 e	0.5 gh	0.0 e	0.0 c	1.8 bc
Actara 25 WG	3 fl oz/A	1.5 d	0.0 e	0.3 gh	0.0 e	0.0 c	0.0 c
Dimethoate 4 E	1 pint/A	0.0 d	0.0 e	0.0 h	0.3 e	0.0 c	1.0 c
Asana 0.66 EC	5.8 fl oz/A	3.5 d	0.8 de	0.3 gh	0.3 e	0.0 c	1.0 c
Pounce 3.2 EC	0.1 lb ai/A	23.5 c	7.5 c	7.8 d	1.8 de	0.0 c	0.0 c
Warrior 1 CS	0.02 lb ai/A	5.3 d	1.3 de	0.0 h	0.5 e	0.0 c	0.0 c
Warrior 1 CS	0.025 lb ai/A	1.8 d	2.3 de	0.8 gh	1.0 de	0.0 c	0.5 c
Warrior 1 CS	0.030 lb ai/A	1.0 d	1.5 de	1.0 gh	0.8 de	0.0 c	0.3 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. (Continued). Potato leafhopper nymphs sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean nymphs per 25 leaves	Mean nymphs per 25 sweeps				
		7-11	7-11	7-15	7-24	7-31	8-6
Thiodan 3 EC	0.75 lb ai/A	6.5 d	3.0 d	1.0 gh	0.5 e	0.0 c	0.0 c
F 1785 50 DF	0.036 lb ai/A	79.3 b	16.5 b	32.0 ab	11.0 ab	3.3 b	4.3 b
F 1785 50 DF	0.053 lb ai/A	65.8 b	8.0 c	29.3 bc	7.0 bc	2.3 b	2.3 bc
F 1785 50 DF	0.071 lb ai/A	81.8 b	16.3 b	24.5 c	3.5 cd	6.8 a	12.5 a
Mustang 1.5 EC	0.05 lb ai/A	1.3 d	0.5 de	4.5 e	1.0 de	0.0 c	0.5 c
FO 570 0.8 EW	0.018 lb ai/A	2.3 d	0.3 e	2.0 fg	0.5 e	0.0 c	0.0 c
Capture 2 E	0.025 lb ai/A	0.0 d	1.3 de	1.8 fg	1.3 de	0.0 c	0.0 c
Untreated	---	151.0 a	56.3 a	38.0 a	14.0 a	0.0 c	DEAD

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. Aphids sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean aphids per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Provado 1.6 SC	3.76 fl oz/A	0.5 a	0.5 abc	0.0 a	0.0 c	1.0 a	0.0 c	0.3 cd	1.3 a	0.0 d
Provado 75 WG	1 oz/A	0.8 a	0.0 c	0.3 a	0.5 bc	0.0 a	0.3 bc	1.3 a-d	0.5 abc	0.0 d
Confidor 200 SL	3.6 fl oz/A	0.0 a	0.3 bc	0.0 a	0.3 c	0.0 a	0.0 c	0.3 cd	0.8 abc	0.0 d
Calypso 4 SC	1.5 fl oz/A	0.8 a	0.3 bc	0.0 a	0.8 bc	0.8 a	0.8 abc	0.8 bcd	0.8 abc	0.8 cd
Calypso 4 SC	3 fl oz/A	0.5 a	0.0 c	0.5 a	0.0 c	0.3 a	0.0 c	0.8 bcd	0.0 c	0.8 cd
YRC 2894 240 SL	2.3 fl oz/A	0.5 a	0.5 abc	0.3 a	0.0 c	0.8 a	0.0 c	0.0 d	0.8 abc	0.8 cd
YRC 2894 240 SL	3 fl oz/A	0.5 a	0.5 abc	0.5 a	0.5 bc	0.5 a	0.5 abc	0.0 d	1.3 ab	1.0 bcd
Baythroid 2 E	0.83 fl oz/A	0.8 a	1.3 a	0.3 a	0.5 bc	0.0 a	0.8 abc	0.5 bcd	0.5 abc	0.0 d
Baythroid 2 E	1.22 fl oz/A	0.0 a	0.3 bc	0.3 a	1.3 ab	0.8 a	0.5 abc	2.0 ab	0.3 bc	3.8 ab

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. (Continued). Aphids sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean aphids per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Leverage 2.7 E	3.75 fl oz/A	0.3 a	0.0 c	0.0 a	2.0 a	0.0 a	1.0 abc	1.3 a-d	0.0 c	0.8 cd
Actara 25 WG	1.5 oz/A	0.0 a	0.0 c	0.0 a	0.0 c	0.0 a	0.5 abc	1.0 bcd	0.0 c	0.0 d
Actara 25 WG	3 fl oz/A	0.8 a	0.0 c	0.0 a	0.5 bc	0.5 a	0.5 abc	0.5 bcd	0.5 abc	0.3 cd
Dimethoate 4 E	1 pint/A	0.3 a	0.0 c	0.3 a	0.0 c	0.3 a	0.0 c	0.3 cd	0.3 bc	0.3 cd
Asana 0.66 EC	5.8 fl oz/A	0.0 a	0.5 abc	0.0 a	0.5 bc	0.0 a	0.3 bc	0.3 cd	0.0 c	0.0 d
Pounce 3.2 EC	0.1 lb ai/A	0.0 a	0.8 abc	0.5 a	0.5 bc	0.3 a	1.0 ab	0.5 bcd	0.0 c	1.5 bcd
Warrior 1 CS	0.02 lb ai/A	0.0 a	0.0 c	0.0 a	1.3 ab	0.8 a	0.0 c	1.0 bcd	0.3 bc	0.0 d
Warrior 1 CS	0.025 lb ai/A	0.0 a	0.0 c	0.3 a	0.5 bc	0.0 a	0.5 abc	0.3 cd	0.0 c	1.8 bcd
Warrior 1 CS	0.030 lb ai/A	0.0 a	0.0 c	0.3 a	0.3 c	0.5 a	0.3 bc	0.8 bcd	0.5 abc	0.0 d

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. (Continued). Aphids sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean aphids per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Thiodan 3 EC	0.75 lb. a.i./A	0.8 a	0.3 bc	0.3 a	0.3 c	0.0 a	0.3 bc	0.0 d	0.0 c	1.0 bcd
F 1785 50 DF	0.036 lb. a.i./A	0.0 a	0.3 bc	0.0 a	0.8 bc	0.5 a	0.0 c	0.5 bcd	0.3 bc	0.5 cd
F 1785 50 DF	0.053 lb. a.i./A	0.3 a	0.0 c	0.0 a	0.0 c	0.3 a	0.3 bc	0.3 cd	0.0 c	2.3 abc
F 1785 50 DF	0.071 lb. a.i./A	0.8 a	0.3 bc	0.5 a	0.8 bc	0.0 a	0.0 c	0.5 bcd	0.5 abc	1.0 bcd
Mustang 1.5 EC	0.05 lb. a.i./A	0.0 a	0.5 abc	0.3 a	0.0 c	0.8 a	1.8 a	2.5 a	0.0 c	6.3 a
FO 570 0.8 EW	0.018 lb. a.i./A	0.0 a	1.0 ab	0.3 a	0.0 c	0.5 a	0.3 bc	1.3 abc	0.5 abc	1.0 bcd
Capture 2 E	0.025 lb. a.i./A	0.0 a	0.0 c	0.0 a	1.5 ab	0.3 a	0.0 c	1.8 abc	0.5 abc	0.3 cd
Untreated	---	0.0 a	0.5 abc	0.0 a	0.5 bc	0.0 a	0.3 bc	0.3 cd	0.0 c	0.0 d

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. Potato flea beetle adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Provado 1.6 SC	3.76 fl oz/A	0.0 b	0.0 b	0.0 a	0.3 ab	1.5 ab	26.8 ab	20.8 d-h	1.3 cd	4.0 b-e
Provado 75 WG	1 oz/A	0.0 b	0.0 b	0.0 a	0.0 b	1.8 ab	18.0 abc	30.5 a-d	0.0 d	2.5 c-g
Confidor 200 SL	3.6 fl oz/A	0.0 b	0.0 b	0.0 a	0.3 ab	2.5 ab	13.3 b-g	21.8 d-h	1.5 cd	4.3 b-f
Calypso 4 SC	1.5 fl oz/A	0.0 b	0.0 b	0.0 a	0.0 b	1.3 ab	27.8 a	37.3 a	0.3 cd	4.5 b-f
Calypso 4 SC	3 fl oz/A	0.0 b	0.0 b	0.0 a	0.0 b	1.0 ab	12.5 b-g	30.8 a-d	1.3 cd	2.8 c-g
YRC 2894 240 SL	2.3 fl oz/A	0.3 a	0.0 b	0.0 a	0.0 b	4.5 a	16.5 a-d	33.5 abc	1.0 cd	3.3 b-g
YRC 2894 240 SL	3 fl oz/A	0.0 b	0.5 a	0.0 a	0.0 b	0.3 b	11.3 c-h	27.0 a-f	1.3 cd	2.8 c-g
Baythroid 2 E	0.83 fl oz/A	0.0 b	0.0 b	0.0 a	1.0 a	0.0 b	3.5 ij	24.0 b-g	0.3 cd	0.3 fg
Baythroid 2 E	1.22 fl oz/A	0.0 b	0.0 b	0.0 a	0.8 ab	0.0 b	17.5 abc	21.3 d-h	0.5 cd	1.5 d-g

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. (Continued). Potato flea beetle adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Leverage 2.7 E	3.75 fl oz/A	0.0 b	0.0 b	0.0 a	0.0 b	0.0 b	2.0 j	24.3 b-g	0.3 cd	2.3 d-g
Actara 25 WG	1.5 oz/A	0.0 b	0.0 b	0.0 a	0.0 b	1.0 ab	8.8 c-i	20.0 d-h	0.5 cd	3.0 b-g
Actara 25 WG	3 fl oz/A	0.0 b	0.0 b	0.0 a	0.0 b	0.5 b	3.5 ij	34.5 ab	1.0 cd	1.8 c-g
Dimethoate 4 E	1 pint/A	0.0 b	0.0 b	0.0 a	0.0 b	2.0 ab	6.0 f-j	19.5 d-h	1.8 cd	5.0 bcd
Asana 0.66 EC	5.8 fl oz/A	0.0 b	0.0 b	0.0 a	0.5 ab	0.5 b	4.5 hij	26.5 a-g	0.5 cd	3.3 b-g
Pounce 3.2 EC	0.1 lb ai/A	0.0 b	0.0 b	0.0 a	0.0 b	0.0 b	6.3 f-j	22 c-h	0.5 cd	0.0 g
Warrior 1 CS	0.02 lb ai/A	0.0 b	0.0 b	0.0 a	0.0 b	0.3 b	7.3 e-j	25.3 a-g	1.0 cd	0.5 efg
Warrior 1 CS	0.025 lb ai/A	0.0 b	0.0 b	0.0 a	0.3 ab	0.3 b	8.0 d-j	25 a-g	0.0 d	1.0 d-g
Warrior 1 CS	0.030 lb ai/A	0.0 b	0.0 b	0.0 a	0.0 b	0.5 b	6.8 e-j	17.8 e-h	0.8 cd	1.0 d-g

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. (Continued). Potato flea beetle adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Thiodan 3 EC	0.75 lb ai/A	0.0 b	0.0 b	0.0 a	0.5 ab	0.3 b	6.5 e-j	16.8 fgh	0.3 cd	5.5 bcd
F 1785 50 DF	0.036 lb ai/A	0.0 b	0.0 b	0.0 a	0.3 ab	1.3 ab	2.0 j	13.0 h	3.0 bc	7.0 abc
F 1785 50 DF	0.053 lb ai/A	0.0 b	0.0 b	0.0 a	0.0 b	2.5 ab	14.8 b-f	17.3 gh	7.8 ab	9.3 ab
F 1785 50 DF	0.071 lb ai/A	0.0 b	0.0 b	0.0 a	0.8 ab	0.8 b	6.3 f-j	16.3 gh	7.0 a	12.5 a
Mustang 1.5 EC	0.05 lb ai/A	0.0 b	0.0 b	0.0 a	0.0 b	0.0 b	16.8 b-e	28.5 a-e	0.3 cd	0.3 fg
FO 570 0.8 EW	0.018 lb ai/A	0.0 b	0.0 b	0.0 a	0.0 b	0.0 b	8.8 d-j	27 a-e	0.0 d	2.0 d-g
Capture 2 E	0.025 lb ai/A	0.0 b	0.0 b	0.0 a	0.0 b	0.0 b	5.5 g-j	23.3 b-g	0.0 d	2.8 c-g
Untreated	---	0.0 b	0.0 b	0.0 a	1.0 a	2.0 ab	4.0 hij	20.8 d-h	2.0 bcd	DEAD

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. Tarnished plant bug adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Provado 1.6 SC	3.76 fl oz/A	0.5 abc	0.3 bc	0.0 b	0.3 bc	1.0 abc	0.3 de	0.5 abc	1.3 ab	0.8 a-d
Provado 75 WG	1 oz/A	0.3 bc	1.0 ab	0.0 b	0.0 c	0.0 c	0.0 e	0.8 abc	0.8 bcd	0.8 a-d
Confidor 200 SL	3.6 fl oz/A	0.5 abc	0.0 c	0.0 b	0.0 c	0.3 bc	0.0 e	0.5 abc	0.3 cd	1.3 a-d
Calypso 4 SC	1.5 fl oz/A	0.0 c	0.5 abc	0.3 ab	0.0 c	0.0 c	0.3 de	1.0 ab	1.3 abc	0.8 bcd
Calypso 4 SC	3 fl oz/A	0.3 bc	0.5 abc	0.3 ab	0.3 bc	0.3 bc	0.0 e	0.3 bc	0.5 bcd	0.3 cd
YRC 2894 240 SL	2.3 fl oz/A	0.3 bc	0.3 bc	0.0 b	1.3 a	1.0 abc	0.5 cde	0.0 c	1.0 bc	0.3 cd
YRC 2894 240 SL	3 fl oz/A	0.3 bc	0.0 c	0.0 b	0.0 c	0.3 bc	1.3 a-d	0.8 abc	0.8 bcd	0.8 a-d
Baythroid 2 E	0.83 fl oz/A	0.3 bc	0.5 abc	0.0 b	0.8 ab	1.0 abc	1.8 abc	0.5 abc	0.0 d	0.3 cd
Baythroid 2 E	1.22 fl oz/A	0.8 abc	0.3 bc	0.0 b	1.3 a	0.8 abc	0.3 de	0.3 bc	0.3 cd	0.5 bcd

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. (Continued). Tarnished plant bug adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Leverage 2.7 E	3.75 fl oz/A	0.0 c	0.3 bc	0.5 a	0.3 bc	1.3 ab	0.0 e	1.0 ab	0.0 d	0.8 a-d
Actara 25 WG	1.5 oz/A	0.3 bc	1.0 ab	0.0 b	0.3 bc	0.5 bc	0.5 b-e	0.8 abc	0.3 cd	1.3 a-d
Actara 25 WG	3 fl oz/A	0.0 c	0.0 c	0.3 ab	0.5 abc	0.8 abc	0.5 b-e	0.5 abc	0.5 bcd	1.3 a-d
Dimethoate 4 E	1 pint/A	0.8 abc	0.0 c	0.5 a	1.0 ab	0.8 abc	1.3 a-d	0.3 bc	0.5 bcd	1.0 a-d
Asana 0.66 EC	5.8 fl oz/A	0.0 c	0.0 c	0.0 b	0.8 abc	1.8 a	0.5 b-e	0.0 c	0.0 d	1.3 a-d
Pounce 3.2 EC	0.1 lb ai/A	1.0 ab	0.8 abc	0.3 ab	0.3 bc	1.0 abc	2.0 a	0.8 abc	0.0 d	1.3 a-d
Warrior 1 CS	0.02 lb ai/A	0.3 bc	0.0 c	0.0 b	0.5 abc	0.3 bc	1.0 a-e	0.3 bc	0.0 d	0.8 a-d
Warrior 1 CS	0.025 lb ai/A	0.0 c	0.0 c	0.0 b	0.5 abc	0.8 abc	1.0 a-e	0.3 bc	0.0 d	0.0 d
Warrior 1 CS	0.030 lb ai/A	0.0 c	0.0 c	0.3 ab	0.3 bc	0.8 abc	0.8 a-e	1.3 a	0.0 d	0.3 cd

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. (Continued). Tarnished plant bug adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 25 sweeps								
		6-28	7-1	7-5	7-8	7-11	7-15	7-24	7-31	8-6
Thiodan 3 EC	0.75 lb ai/A	0.3 bc	0.8 abc	0.0 b	0.5 abc	0.0 c	1.5 a-d	0.3 bc	0.3 cd	2.0 ab
F 1785 50 DF	0.036 lb ai/A	1.3 a	1.3 a	0.3 ab	0.5 abc	0.5 abc	0.0 e	0.0 c	0.5 bcd	1.0 a-d
F 1785 50 DF	0.053 lb ai/A	0.5 abc	1.3 a	0.3 ab	0.3 bc	0.0 c	0.5 b-e	0.5 abc	0.3 cd	0.8 a-d
F 1785 50 DF	0.071 lb ai/A	1.3 ab	1.0 ab	0.3 ab	0.5 abc	0.8 abc	2.0 a	0.5 abc	1.0 bcd	2.3 a
Mustang 1.5 EC	0.05 lb ai/A	0.0 c	0.0 c	0.0 b	0.8 abc	0.3 bc	0.5 b-e	0.0 c	0.0 d	0.0 d
FO 570 0.8 EW	0.018 lb ai/A	0.3 bc	0.3 bc	0.3 ab	0.0 c	0.5 abc	1.0 a-e	1.0 abc	0.0 d	1 a-d
Capture 2 E	0.025 lb ai/A	0.8 abc	1.3 a	0.3 ab	0.8 abc	0.3 bc	1.0 a-e	1.3 ab	0.0 d	1.8 abc
Untreated	---	0.8 abc	1.0 ab	0.0 b	0.8 abc	1.0 abc	1.8 ab	0.8 abc	2.5 a	DEAD

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 6. Yield and grade of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Percent grade		Yield (Cwt/A)
		A's	B's and culls	
Provado 1.6 SC	3.76 fl oz/A	91.3 a	8.7 d	168.8 a-d
Provado 75 WG	1 oz/A	91.5 a	8.5 d	181.5 a-d
Confidor 200 SL	3.6 fl oz/A	87.3 abc	12.7 bcd	173.8 a-d
Calypso 4 SC	1.5 fl oz/A	89.5 abc	10.5 bcd	164.3 a-d
Calypso 4 SC	3 fl oz/A	88.1 abc	11.9 bcd	170.2 a-d
YRC 2894 240 SL	2.3 fl oz/A	86.4 abc	13.6 bcd	169.7 a-d
YRC 2894 240 SL	3 fl oz/A	90.3 ab	9.7 cd	169.7 a-d
Baythroid 2 E	0.83 fl oz/A	89.9 ab	10.1 cd	140.2 cd
Baythroid 2 E	1.22 fl oz/A	88.1 abc	11.9 bcd	172.0 a-d
Leverage 2.7 E	3.75 fl oz/A	91.3 a	8.7 d	180.6 a-d
Actara 25 WG	1.5 oz/A	81.0 cd	19.0 ab	149.7 a-d
Actara 25 WG	3 fl oz/A	89.7 ab	10.3 cd	184.7 abc
Dimethoate 4 E	1 pint/A	87.8 abc	12.2 bcd	157.0 a-d

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 6. (Continued). Yield and grade of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Percent grade		Yield (Cwt/A)
		A's	B's and culls	
Asana 0.66 EC	5.8 fl oz/A	85.8 abc	14.2 bcd	173.3 a-d
Pounce 3.2 EC	0.1 lb. ai/A	91.0 ab	9.0 cd	137.0 d
Warrior 1 CS	0.02 lb. ai/A	87.2 abc	12.8 bcd	157.4 a-d
Warrior 1 CS	0.025 lb. ai/A	82.4 bcd	17.6 abc	136.1 d
Warrior 1 CS	0.030 lb. ai/A	86.9 abc	13.1 bcd	161.1 a-d
Thiodan 3 EC	0.75 lb. ai/A	85.4 abc	14.6 bcd	181.0 a-d
F 1785 50 DF	0.036 lb. ai/A	84.1 a-d	15.9 a-d	163.3 a-d
F 1785 50 DF	0.053 lb. ai/A	85.1 abc	14.9 bcd	144.7 bcd
F 1785 50 DF	0.071 lb. ai/A	87.0 abc	13.0 bcd	193.7 a
Mustang 1.5 EC	0.05 lb. ai/A	86.3 abc	13.7 bcd	174.2 a-d
FO 570 0.8 EW	0.018 lb. ai/A	85.4 abc	14.6 bcd	147.5 bcd
Capture 2 E	0.025 lb. ai/A	84.4 a-d	15.6 a-d	190.6 ab
Untreated	---	75.9 d	24.1 a	87.6 e

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Part 2. Insect Control with Foliar Insecticides.

B. Colorado Potato Beetle Control with Registered and Experimental Insecticides – Arlington 2002.

Plots consisting of two 60” rows of Superior variety potatoes were planted on April 16 with four replicates of 37 treatments arranged in a randomized complete block experimental design. Plots were separated by 12’ of alleyway and replicates were 15’ apart. Plots were hilled on April 18 and Matrix (rimsulfuron) at the rate of 1-ounce product per acre and Lexone (metribuzin) at the rate of 0.5 pounds product per acre were applied on May 10 for weed control. Plots were also hand weeded as necessary to maintain weed control.

Orthene 97 (acephate) at the rate of 1 lb. pr./A was applied on June 25 and July 16 for potato leafhopper adult control. Dithane (mancozeb) at the rate of 2 lb./A was applied for disease control July 16.

Seven registered and eight non-registered materials were evaluated at the following rates.

Synthetic pyrethroids-registered:

Asana 0.66E (6 and 8 fl. oz./A); Baythroid 2EC (1.6 fl. oz./A); Mustang 1.5EC (0.05 lb. a.i./A); Leverage 2.7SE (3.75 lb. a.i./A).

Synthetic pyrethroids-unregistered:

FO 570 0.8EW (0.018 and 0.025 lb. a.i./A); Warrior 1CS (54.34, 69.16, and 83.98 g. a.i./A)

Others-registered:

Thiodan 3EC (1.0 lb. a.i./A); Provado 1.6SC (1.8, 2.25, and 3.75 fl. oz./A); Provado 75WG (1.0 oz. wt./A); Actara 25WG (0.75, 1.5, and 3.0 oz. wt./A); Spintor 2SC (4.5 fl. oz./A); Avaunt 30DG (3.5 oz. wt./A.)

Others-unregistered:

Confidor 200SL (1.8 fl. oz./A); Calypso 4SC (0.751 and 1.15 fl. oz./A); YRC 2894 240SL (1.15, 1.5, and 2.3 fl. oz./A); Novaluron 0.83EC (0.039, 0.058, and 0.079 lb. a.i./A); V10112 20SG (20 and 40 g. a.i./A).

All materials were applied with a tractor mounted compressed air boom sprayer operating at 38 psi while delivering 22 gpa through five flat fan nozzles (XR8002) spaced at 18".

Insecticides were applied once in June for first generation Colorado potato beetle (CPB) larval control and once in July for second-generation larval and adult control. Insecticide treatments targeting first generation larvae were evaluated at 2, 4, 8, 14, 23 and 30 days after the first insecticide application (June 24) and at 2 and 9 days after the second application (July 31). CPB populations were monitored by plant counts. All life stages of the CPB were counted on ten randomly chosen plants per plot. CPB pressure was light compared to past seasons and CPB pressure was highest in replication 1 and progressively diminished through replications 2-4.

Plant foliage was rated for defoliation on each survey date from June 24 through August 7. The growing conditions in 2002 were atypical of normal conditions due to extraordinary dry weather conditions in June and July. Typically rapidly expanding potato foliage in June and early July will out grow leaf defoliation caused by CPB larvae once they have been controlled. However in 2002 the plants did not recover from early defoliation thus resulting in higher than normal defoliation ratings among the plots. The study was vine killed with Reglone (diquat) at the rate of 2 pints product per acre and was tank mixed with X77 at the rate of 8-oz/100 gallon on August 8. The study was harvested for yield and grade on August 31.

RESULTS

Adult CPB's were first observed in the plots shortly after potato emergence in early May, however adult numbers were at very low levels in May and June and numbers peaked prior to initiation of insect surveys on June 24 (Table 1). Adult numbers declined steadily through late June and early July until second generation adult numbers began to increase in the plots during mid-July, reaching a peak of 3.9 adults per plant on July 17. After peaking in mid-July adult numbers declined in the untreated plots and remained at low levels through

late July and early August. First generation adult oviposition occurred during late May and early June but due to below average air temperatures many egg masses failed to hatch and small larvae numbers did not peak until June 24 (Tables 2 and 3). First generation large larval numbers peaked at 7.0 larvae per plant on June 26 and resulted in defoliation ratings of 15 percent in the untreated plots (Tables 4 and 5). Few second-generation larvae were produced, however second generation adults caused defoliation ratings in the untreated plots to increase from 15 to 95 percent by the study's end on August 7 (Table 5).

Insecticide applications were initiated on June 24 when small larval numbers (1^{st} and 2^{nd} instar) ranged from 1.3 to 5.3 larvae per plant and large larval (3^{rd} and 4^{th} instar) numbers ranged from 1.9 to 11.0 larvae per plant (Tables 3 and 4). Small and large larval numbers peaked in the untreated plots on June 26 and remained at high levels until the second week of July. As mentioned earlier second generation larval numbers were at low levels, however a second application was made on July 31 for larval and adult control.

All the materials evaluated effectively reduced small and large larval numbers after application and all treatments had significantly fewer larvae than the untreated plots. Small larvae are typically much easier to control than are large larvae and adults and this is reflected in the surveys. On June 26, 2 days after application, small larval numbers were at significantly lower levels in all the treatments except those in the insect growth regulator (Novaluron) plots. Small larval numbers continued to decline in the Novaluron treatments and by 4 days after application larval numbers were similar to those in the other insecticide treatments. Large larval numbers also significantly declined among the insecticide treatments after initial insecticide applications except for the Novaluron treatments. Large larval numbers remained higher in the Novaluron treatments until the first of July. Second generation larval numbers were at lower levels than the first generation numbers had been but when combined with adult numbers defoliation was significantly increasing among the plots. Insecticide applications on July 31 reduced adult and larval numbers in the plots in trends similar to those seen after the first insecticide application.

Growing conditions in 2002 were dryer and warmer than normal but all treatments yielded higher than the untreated plots and few significant differences were detected among treatments (Table 5).

Table 1. Colorado potato beetle adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Provado 1.6SC	1.8 fl. oz./A	2.0 a-d	0.0 d	0.8 cde	0.5 abc	5.0 bcd	9.3 bc	18.5 abc	0.5 fg	2.0 b-i
Provado 1.6SC	2.25 fl. oz./A	1.5 bcd	0.0 d	0.3 e	0.0 c	1.8 c-j	6.0 b-f	10.0 c-f	0.8 d-g	3.5 a-e
Provado 1.6SC	3.75 fl. oz./A	2.3 a-d	0.3 cd	0.8 cde	0.3 bc	3.5 b-g	5.0 b-g	13.8 cde	1.5 b-g	1.5 c-i
Provado 75WG	1.0 oz. wt./A	4.0 abc	0.0 d	1.0 b-e	0.0 c	3.8 b-f	5.0 b-g	12.5 c-f	0.3 g	3.8 a-f
Baythroid 2E	1.6 fl. oz./A	2.3 a-d	0.5 cd	0.8 cde	1.3 ab	3.8 b-h	7.8 b-g	10.0 def	2.0 a-e	1.3 e-i
Actara 25WG	1.5 oz. wt./A	3.0 a-d	0.3 cd	0.0 e	0.3 bc	2.5 b-j	8.0 b-f	4.5 ef	1.0 d-g	0.5 i
Leverage 2.7SE	3.75 fl. oz./A	2.3 a-d	0.0 d	0.0 e	0.0 c	4.0 b-e	3.3 b-g	4.5 ef	0.5 efg	1.0 f-i
Actara 25WG	3.0 oz. wt./A	2.0 a-d	0.3 cd	0.0 e	0.3 bc	1.5 c-j	3.3 b-g	6.5 ef	0.8 d-g	1.0 f-i
Asana XL 0.66EC	8.0 fl. oz./A	4.3 ab	0.0 d	0.0 e	0.3 bc	4.5 bcd	5.5 b-g	7.3 def	1.3 b-g	1.0 ghi
Asana XL 0.66EC + PBO	8.0 fl. oz./A + 4.0 fl. oz./A	2.0 a-d	0.5 cd	0.5 e	0.5 abc	5.0 bc	6.5 b-f	10.3 c-f	1.0 d-g	2.5 b-i

Means in a column followed by the same letter are not significantly different.
(Least Significant Difference Test, P = 0.05).

Table 1. (Continued). Colorado potato beetle adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Asana XL 0.66EC + Actara 25WG	6.0 fl. oz./A + 0.75 oz. wt./A	4.3 a	0.0 d	0.0 e	0.0 c	1.8 b-j	9.8 b	9.5 c-f	1.5 b-g	2.3 c-i
Asana XL 0.66EC + Vydate 3.77SL	6 fl. oz./A + 1.0 pt./A	3.0 a-d	0.0 d	1.0 b-e	0.5 abc	2.5 b-j	2.8 c-g	5.5 ef	1.0 d-g	1.5 d-i
Confidor 200SL	1.8 fl. oz./A	2.8 a-d	0.0 d	0.5 e	0.0 c	2.5 b-j	4.8 b-g	8.3 c-f	1.5 b-g	1.0 ghi
Calypso 4SC	0.751 fl. oz./A	1.5 bcd	0.0 d	0.3 e	0.0 c	0.5 hij	3.5 b-g	7.3 def	0.5 fg	2.5 b-h
Calypso 4SC	1.15 fl. oz./A	3.3 a-d	0.5 cd	0.8 cde	0.3 bc	1.0 e-j	2.5 d-g	4.0 ef	1.0 d-g	2.0 c-i
F0570 0.8EW	0.018 lb. a.i./A	1.5 bcd	0.0 d	0.5 e	0.3 bc	2.8 b-i	5.8 b-g	4.5 ef	1.0 d-g	3.0 a-g
F0570 0.8EW	0.025 lb. a.i./A	2.3 a-d	0.3 cd	0.0 e	1.0 ab	1.0 f-j	3.3 b-g	7.8 def	1.5 b-g	2.0 d-i
Warrior 1CS	54.34 g. a.i./A	1.5 bcd	0.0 d	0.0 e	0.0 c	0.0 j	1.5 fg	5.3 ef	0.8 d-g	2.3 b-i
Warrior 1CS	69.16 g. a.i./A	0.8 d	0.0 d	0.8 cde	0.0 c	0.0 j	2.8 efg	3.5 f	1.3 c-g	1.3 e-i
Warrior 1CS	83.98 g. a.i./A	3.0 a-d	0.0 d	0.0 e	0.0 c	1.3 d-j	0.5 g	5.0 ef	0.5 efg	1.3 e-i

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 1. (Continued). Colorado potato beetle adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Mustang 1.5EC	0.05 lb. a.i./A	3.0 a-d	0.3 cd	0.3 e	0.3 bc	3.0 b-h	2.3 d-g	4.5 ef	1.0 d-g	1.3 e-i
Thiodan 3EC	1.0 lb. a.i./A	4.3 a	0.3 cd	0.3 e	0.5 abc	1.8 b-j	3.3 b-g	9.3 c-f	0.3 g	4.0 abc
YRC 2894 240SL	1.15 fl. oz./A	1.3 cd	0.0 d	0.0 e	0.0 c	1.3 d-j	1.8 fg	5.0 ef	1.5 b-g	3.8 a-d
YRC 2894 240SL	1.5 fl. oz./A	2.0 a-d	0.0 d	0.0 e	0.3 bc	0.3 ij	2.0 efg	8.3 def	1.5 b-g	1.0 f-i
YRC 2894 240SL	2.3 fl. oz./A	2.5 a-d	0.3 cd	0.8 cde	0.3 bc	2.0 b-j	3.8 b-g	6.5 def	0.5 fg	0.5 hi
Spinosad 2SC	4.5 fl. oz./A	1.8 a-d	0.8 bcd	0.8 de	0.3 bc	2.0 c-j	1.5 fg	5.0 ef	0.8 d-g	2.8 b-h
Avaunt 30DG + PBO	3.5 oz. wt./A + 4.0 fl. oz./A	3.3 a-d	0.5 cd	2.0 abc	1.0 ab	0.8 g-j	8.3 b-e	31.0 ab	3.0 abc	1.3 e-i
Avaunt 30DG + Actara 25WG	3.5 oz. wt./A + 0.75 oz. wt./A	1.5 a-d	0.0 d	0.5 e	0.0 c	0.3 ij	2.5 d-g	6.0 ef	0.5 fg	2.0 b-i
Avaunt 30DG + PBO	5.0 oz. wt./A + 4.0 fl. oz./A	1.8 a-d	0.3 cd	0.8 cde	0.0 c	3.8 b-j	9.0 bcd	27.0 ab	2.3 a-d	1.3 e-i

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 1. (Continued). Colorado potato beetle adults sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean adults per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Novaluron 0.83EC	0.039 lb. a.i./A	1.5 a-d	1.0 bc	0.8 cde	0.8 abc	5.3 b	7.8 b-g	7.5 def	3.0 ab	1.5 c-i
Novaluron 0.83EC	0.058 lb. a.i./A	2.3 a-d	1.8 b	2.0 bcd	0.0 c	2.5 b-j	0.5 g	4.3 ef	2.0 a-f	2.3 b-i
Novaluron 0.83EC	0.079 lb. a.i./A	2.5 a-d	1.3 bc	3.3 a	1.3 a	3.5 b-h	3.5 b-g	7.5 def	1.3 c-g	1.0 ghi
V10112 20SG	20 g. a.i./A	2.5 a-d	0.0 d	0.3 e	0.5 abc	3.3 b-h	6.0 b-f	18.0 bcd	2.3 a-d	3.5 a-f
V10112 20SG + Silwet 100	20 g. a.i./A + 0.07 % v/v	4.3 ab	0.0 d	0.3 e	0.5 abc	1.8 c-j	6.5 b-f	18.5 bcd	1.3 c-g	5.8 a
V10112 20SG	40 g. a.i./A	3.5 abc	0.0 d	0.5 e	0.5 abc	0.8 f-j	9.3 b-g	10.0 c-f	1.3 b-g	4.8 ab
Untreated	---	1.8 a-d	3.3 a	2.0 ab	0.5 abc	17.8 a	39.0 a	33.0 a	3.5 a	3.3 a-e
V10112 20SG + Silwet 100	40 G A/A + 0.07 % v/v	3.3 a-d	1.0 bc	0.0 e	0.3 bc	3.5 b-j	2.3 efg	10.8 c-f	0.8 d-g	1.8 c-i

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. Colorado potato beetle egg masses sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean egg masses per 10 plants						
		6-24	6-26	6-28	7-2	7-8	7-17	7-24
Provado 1.6SC	1.8 fl. oz./A	0.5 abc	1.5 a-g	0.8 a-d	0.0 b	0.0 c	0.8 ab	0.0 c
Provado 1.6SC	2.25 fl. oz./A	1.5 ab	1.5 a-g	0.5 bcd	0.0 b	0.0 c	1.3 ab	0.0 c
Provado 1.6SC	3.75 fl. oz./A	0.5 abc	2.5 a-e	0.0 d	0.3 ab	0.0 c	1.8 a	1.0 ab
Provado 75WG	1.0 oz. wt./A	0.5 abc	1.5 a-g	0.8 a-d	0.0 b	0.0 c	1.3 ab	0.3 c
Baythroid 2E	1.6 fl. oz./A	0.3 bc	2.0 a-g	1.8 a	0.3 ab	0.5 abc	0.5 ab	0.0 c
Actara 25WG	1.5 oz. wt./A	0.0 c	2.0 a-g	1.5 ab	0.0 b	0.3 bc	1.3 ab	0.3 c
Leverage 2.7SE	3.75 fl. oz./A	0.8 abc	1.8 a-g	0.5 a-d	0.5 ab	0.3 bc	2.0 ab	0.3 c
Actara 25WG	3.0 oz. wt./A	0.5 abc	0.0 g	1.3 abc	0.3 ab	0.0 c	1.3 ab	0.0 c
Asana XL 0.66EC	8.0 fl. oz./A	0.3 bc	1.0 b-g	0.5 a-d	0.3 ab	1.3 ab	1.5 ab	0.3 c
Asana XL 0.66EC + PBO	8.0 fl. oz./A + 4.0 fl. oz./A	1.8 ab	3.3 abc	0.5 a-d	0.0 b	0.3 bc	1.3 ab	0.3 c

Means in a column followed by the same letter are not significantly different.
(Least Significant Difference Test, P = 0.05).

Table 2. (Continued). Colorado potato beetle egg masses sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean egg masses per 10 plants						
		6-24	6-26	6-28	7-2	7-8	7-17	7-24
Asana XL 0.66EC + Actara 25WG	6.0 fl. oz./A + 0.75 oz. wt./A	0.5 abc	1.8 a-g	0.3 cd	0.3 ab	0.3 bc	1.3 ab	0.3 c
Asana XL 0.66EC + Vydate 3.77SL	6 fl. oz./A + 1.0 pt./A	0.0 c	0.3 fg	0.0 d	0.0 b	1.0 ab	0.5 ab	0.3 c
Confidor 200SL	1.8 fl. oz./A	1.0 abc	2.0 a-g	0.5 a-d	0.0 b	0.3 bc	0.0 b	0.3 c
Calypso 4SC	0.751 fl. oz./A	0.8 abc	1.0 b-g	1.3 abc	0.0 b	0.0 c	0.8 ab	0.0 c
Calypso 4SC	1.15 fl. oz./A	1.0 abc	2.0 a-g	0.5 a-d	0.0 b	0.3 bc	1.0 ab	0.0 c
F0570 0.8EW	0.018 lb. a.i./A	1.3 abc	0.8 d-g	0.5 a-d	0.3 ab	1.3 ab	0.8 ab	0.0 c
F0570 0.8EW	0.025 lb. a.i./A	1.0 abc	1.8 a-g	0.3 cd	0.3 ab	0.3 bc	0.5 ab	0.0 c
Warrior 1CS	54.34 g. a.i./A	2.3 a	3.8 a	1.0 a-d	0.3 ab	0.5 bc	1.5 ab	0.0 c
Warrior 1CS	69.16 g. a.i./A	0.8 abc	0.5 efg	0.5 a-d	0.0 b	0.0 c	1.0 ab	0.3 c
Warrior 1CS	83.98 g. a.i./A	2.0 a	2.0 a-f	0.3 cd	0.0 b	0.0 c	0.0 b	0.3 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. (Continued). Colorado potato beetle egg masses sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean egg masses per 10 plants						
		6-24	6-26	6-28	7-2	7-8	7-17	7-24
Mustang 1.5EC	0.05 lb. a.i./A	0.3 bc	0.8 c-g	0.8 a-d	0.0 b	0.0 c	0.8 ab	0.5 bc
Thiodan 3EC	1.0 lb. a.i./A	1.0 abc	0.8 c-g	1.5 ab	0.0 b	0.3 bc	1.3 ab	1.3 a
YRC 2894 240SL	1.15 fl. oz./A	0.8 abc	1.0 b-g	0.8 a-d	0.0 b	0.0 c	0.8 ab	0.0 c
YRC 2894 240SL	1.5 fl. oz./A	1.0 abc	1.3 b-g	0.8 a-d	0.0 b	0.8 abc	1.0 ab	0.0 c
YRC 2894 240SL	2.3 fl. oz./A	0.0 c	1.5 a-g	0.3 cd	0.0 b	0.0 c	2.5 a	0.0 c
Spinosad 2SC	4.5 fl. oz./A	1.8 ab	3.0 a-d	0.5 a-d	0.5 a	0.0 c	0.5 ab	0.5 bc
Avaunt 30DG + PBO	3.5 oz. wt./A + 4.0 fl. oz./A	0.8 abc	1.8 a-g	1.3 abc	0.3 ab	0.0 c	0.5 ab	0.3 c
Avaunt 30DG + Actara 25WG	3.5 oz. wt./A + 0.75 oz. wt./A	1.0 abc	1.5 a-g	0.3 cd	0.0 b	0.0 c	0.0 b	0.5 bc
Avaunt 30DG + PBO	5.0 oz. wt./A + 4.0 fl. oz./A	1.5 ab	1.8 a-g	0.5 bcd	0.0 b	0.3 bc	1.0 ab	0.0 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. (Continued). Colorado potato beetle egg masses sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean egg masses per 10 plants						
		6-24	6-26	6-28	7-2	7-8	7-17	7-24
Novaluron 0.83EC	0.039 lb. a.i./A	1.0 abc	1.5 a-g	1.0 a-d	0.5 a	0.5 bc	0.8 ab	0.0 c
Novaluron 0.83EC	0.058 lb. a.i./A	1.8 ab	2.3 a-f	0.5 bcd	0.0 b	1.5 a	0.5 ab	0.0 c
Novaluron 0.83EC	0.079 lb. a.i./A	1.5 ab	1.5 a-g	1.3 abc	0.5 ab	0.5 abc	2.3 a	0.0 c
V10112 20SG	20 g. a.i./A	1.3 abc	2.5 a-e	1.8 ab	0.0 b	0.3 bc	0.5 ab	0.3 c
V10112 20SG + Silwet 100	20 g. a.i./A + 0.07 % v/v	1.0 abc	3.3 ab	1.8 ab	0.0 b	0.0 c	1.8 a	0.5 bc
V10112 20SG	40 g. a.i./A	1.5 abc	2.0 a-g	0.0 d	0.0 b	0.0 c	1.3 ab	0.3 c
Untreated	---	0.0 c	0.8 c-g	0.5 a-d	0.0 b	0.0 c	0.0 b	0.0 c
V10112 20SG + Silwet 100	40 G A/A + 0.07 % v/v	1.3 abc	1.0 b-g	0.5 bcd	0.0 b	0.3 bc	1.3 ab	0.3 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. Colorado potato beetle small larvae sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean larvae per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Provado 1.6SC	1.8 fl. oz./A	52.3 ab	4.5 d-h	0.5 gh	9.8 b	0.0 c	0.8 cde	10.8 a-f	0.5 a	0.0 c
Provado 1.6SC	2.25 fl. oz./A	33.8 a-g	2.0 fgh	1.5 fgh	5.8 bc	0.0 c	0.0 e	8.8 a-h	0.5 a	0.0 c
Provado 1.6SC	3.75 fl. oz./A	45.0 a-e	3.5 e-h	1.0 gh	1.0 cd	0.0 c	0.0 e	3.0 e-h	0.3 a	0.0 c
Provado 75WG	1.0 oz. wt./A	43.8 a-d	3.8 fgh	1.0 gh	2.3 cd	0.0 c	0.5 de	18.0 ab	0.8 a	0.0 c
Baythroid 2E	1.6 fl. oz./A	45.5 a-e	8.0 b-f	3.0 b-h	1.8 cd	0.0 c	1.8 b-e	11.0 a-f	0.3 a	0.3 c
Actara 25WG	1.5 oz. wt./A	34.5 a-g	11.3 b-e	4.8 b-g	1.0 cd	0.0 c	1.0 cde	15.3 a-d	0.0 a	0.0 c
Leverage 2.7SE	3.75 fl. oz./A	40.3 a-f	2.0 fgh	2.3 e-h	0.0 d	0.0 c	0.0 e	12.5 a-f	0.5 a	0.0 c
Actara 25WG	3.0 oz. wt./A	39.5 a-e	3.0 e-h	3.5 b-h	1.3 cd	0.0 c	0.3 e	11.5 a-f	0.3 a	0.0 c
Asana XL 0.66EC	8.0 fl. oz./A	51.3 a-d	5.5 c-h	1.8 e-h	2.5 cd	0.0 c	5.0 ab	10.0 a-e	0.3 a	1.5 a
Asana XL 0.66EC + PBO	8.0 fl. oz./A + 4.0 fl. oz./A	46.3 a-e	5.0 d-h	3.0 b-h	1.5 cd	0.0 c	0.5 de	9.0 a-f	0.3 a	0.0 c

Means in a column followed by the same letter are not significantly different.
(Least Significant Difference Test, P = 0.05).

Table 3. (Continued). Colorado potato beetle small larvae sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean larvae per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Asana XL 0.66EC + Actara 25WG	6.0 fl. oz./A + 0.75 oz. wt./A	39.3 a-e	4.0 d-h	1.8 e-h	0.0 d	0.0 c	0.0 e	12.3 a-f	0.5 a	0.0 c
Asana XL 0.66EC + Vydate 3.77SL	6 fl. oz./A + 1.0 pt./A	37.5 a-g	2.3 fgh	1.8 e-h	2.3 cd	0.5 bc	3.8 a-e	10.8 a-f	0.0 a	0.0 c
Confidor 200SL	1.8 fl. oz./A	29.8 a-g	2.5 fgh	2.0 d-h	1.5 cd	0.0 c	0.0 e	3.5 d-h	0.0 a	0.0 c
Calypso 4SC	0.751 fl. oz./A	29.3 a-g	2.5 fgh	1.5 fgh	0.0 d	0.0 c	0.0 e	16.8 a	0.0 a	0.0 c
Calypso 4SC	1.15 fl. oz./A	35.3 a-g	2.0 fgh	5.3 b-g	0.5 d	0.0 c	0.0 e	13.5 a-f	0.8 a	0.0 c
F0570 0.8EW	0.018 lb. a.i./A	28.3 a-g	0.8 h	8.0 bc	0.3 d	1.0 b	6.5 a	9.3 a-f	0.0 a	0.0 c
F0570 0.8EW	0.025 lb. a.i./A	29.8 a-g	2.3 fgh	1.5 e-h	0.0 d	0.0 c	1.8 b-e	8.3 a-g	0.3 a	0.0 c
Warrior 1CS	54.34 g. a.i./A	42.5 a-d	2.8 fgh	4.8 b-g	0.0 d	0.0 c	0.0 e	5.0 d-h	0.0 a	0.0 c
Warrior 1CS	69.16 g. a.i./A	37.8 a-d	4.0 e-h	0.0 h	0.5 d	0.0 c	1.3 cde	0.0 h	0.0 a	0.0 c
Warrior 1CS	83.98 g. a.i./A	29.8 a-g	1.0 gh	1.5 fgh	0.0 d	0.0 c	0.3 e	0.0 h	0.5 a	0.0 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. (Continued). Colorado potato beetle small larvae sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean larvae per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Mustang 1.5EC	0.05 lb. a.i./A	23.3 a-g	5.0 d-h	2.0 d-h	0.3 d	0.0 c	0.0 e	3.8 d-h	0.0 a	0.0 c
Thiodan 3EC	1.0 lb. a.i./A	31.3 a-f	1.5 fgh	2.8 c-h	1.8 cd	0.0 c	0.8 cde	4.3 d-h	0.0 a	0.0 c
YRC 2894 240SL	1.15 fl. oz./A	14.8 fg	1.3 gh	1.0 gh	1.5 cd	0.0 c	3.5 b-e	2.5 e-h	0.5 a	0.3 c
YRC 2894 240SL	1.5 fl. oz./A	30.5 a-g	4.5 e-h	2.8 c-h	0.3 d	0.0 c	0.5 de	0.0 h	0.0 a	0.0 c
YRC 2894 240SL	2.3 fl. oz./A	34.0 a-f	1.8 gh	6 b-g	0.5 d	0.0 c	0.0 e	7.0 c-h	0.0 a	0.5 bc
Spinosad 2SC	4.5 fl. oz./A	19.3 d-g	5.8 d-h	0.0 h	1.0 cd	0.0 c	1.0 cde	4.8 a-h	0.3 a	0.0 c
Avaunt 30DG + PBO	3.5 oz. wt./A + 4.0 fl. oz./A	14.0 efg	5.0 d-h	8.5 b	11.3 b	0.0 c	4.5 abc	4.3 d-h	0.5 a	0.5 abc
Avaunt 30DG + Actara 25WG	3.5 oz. wt./A + 0.75 oz. wt./A	22.8 c-g	3.5 e-h	1.3 fgh	0.5 d	0.0 c	0.0 e	5.0 b-h	0.0 a	0.8 abc
Avaunt 30DG + PBO	5.0 oz. wt./A + 4.0 fl. oz./A	30.0 a-g	5.8 c-h	2.8 c-h	22.8 a	0.0 c	0.5 de	7.3 a-h	0.0 a	1.5 ab

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. (Continued). Colorado potato beetle small larvae sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean larvae per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Novaluron 0.83EC	0.039 lb. a.i./A	14.3 fg	12.8 bc	5.8 b-f	2.3 cd	0.0 c	1.0 cde	0.3 gh	0.5 a	0.0 c
Novaluron 0.83EC	0.058 lb. a.i./A	12.8 g	10.8 bcd	2.3 c-h	1.8 cd	0.0 c	1.0 cde	6.5 a-h	0.5 a	0.0 c
Novaluron 0.83EC	0.079 lb. a.i./A	20.0 c-g	13.3 b	6.0 b-e	3.0 cd	0.0 c	0.0 e	2.3 fgh	0.8 a	0.8 abc
V10112 20SG	20 g. a.i./A	22.3 b-g	2.5 fgh	3.0 c-h	3.0 cd	0.0 c	1.8 b-e	7.0 a-h	0.3 a	0.0 c
V10112 20SG + Silwet 100	20 g. a.i./A + 0.07 % v/v	43.8 abc	2.8 fgh	7.3 bcd	1.5 cd	0.8 bc	1.8 b-e	17.5 abc	0.3 a	0.0 c
V10112 20SG	40 g. a.i./A	31.0 a-g	5.5 d-h	1.3 fgh	0.5 d	0.0 c	6.8 a-d	3.8 d-h	0.3 a	0.0 c
Untreated	---	46.0 a	68.8 a	40.5 a	21.8 a	2.3 a	0.0 e	0.0 h	0.0 a	0.0 c
V10112 20SG + Silwet 100	40 G A/A + 0.07 % v/v	34.3 a-g	6.0 b-g	1.0 gh	1.5 cd	0.0 c	2.0 b-e	11.3 a-f	0.0 a	0.0 c

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. Colorado potato beetle large larvae sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean larvae per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Provado 1.6SC	1.8 fl. oz./A	110.0 a	4.3 c	7.5 b-e	20.3 b	16.3 bcd	4.5 a-d	2.5 b-f	0.8 efg	5.5 ab
Provado 1.6SC	2.25 fl. oz./A	54.0 bcd	1.5 cd	4.5 d-h	6.8 d-g	13.0 c-f	0.5 cd	10.5 ab	1.5 c-g	3.8 abc
Provado 1.6SC	3.75 fl. oz./A	51.0 bcd	2.3 cd	2.3 e-i	2.3 e-j	11.8 c-g	0.8 bcd	4.0 a-f	1.8 a-g	0.3 hi
Provado 75WG	1.0 oz. wt./A	65.5 ab	1.0 cd	1.5 ghi	2.3 e-j	9.8 d-h	0.0 d	3.8 a-f	0.0 g	0.5 ghi
Baythroid 2E	1.6 fl. oz./A	58.0 bcd	3.8 cd	4.8 d-g	4.3 d-j	5.3 e-m	5.0 ab	5.3 a-f	2.0 a-g	2.5 c-g
Actara 25WG	1.5 oz. wt./A	60.0 abc	5.0 cd	0.0 i	1.8 e-j	3.8 g-m	0.8 bcd	5.0 a-f	1.0 c-g	0.5 f-i
Leverage 2.7SE	3.75 fl. oz./A	42.3 bcd	0.5 cd	1.0 ghi	0.8 hij	2.0 j-m	0.0 d	1.3 def	1.0 d-g	0.8 f-i
Actara 25WG	3.0 oz. wt./A	43.8 bcd	0.8 cd	0.0 i	0.3 ij	2.8 h-m	0.5 cd	3.3 b-f	0.3 fg	0.0 i
Asana XL 0.66EC	8.0 fl. oz./A	39.8 bcd	5.0 cd	6.8 c-f	7.8 cde	5.5 e-k	1.5 a-d	6.0 a-e	5.5 a	6.5 a
Asana XL 0.66EC + PBO	8.0 fl. oz./A + 4.0 fl. oz./A	50.0 a-d	1.8 cd	5.5 c-f	6.0 def	6.0 e-j	2.3 a-d	14.3 a	4.3 ab	2.0 c-h

Means in a column followed by the same letter are not significantly different.
(Least Significant Difference Test, P = 0.05).

Table 4. (Continued). Colorado potato beetle large larvae sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean larvae per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Asana XL 0.66EC + Actara 25WG	6.0 fl. oz./A + 0.75 oz. wt./A	31.0 bcd	0.5 cd	0.5 hi	0.8 hij	2.3 i-m	0.8 bcd	3.0 a-f	1.5 c-g	1.0 d-i
Asana XL 0.66EC + Vydate 3.77SL	6 fl. oz./A + 1.0 pt./A	42.3 bcd	2.3 cd	6.3 c-f	4.3 d-i	2.8 h-m	1.0 a-d	3.0 b-f	0.8 efg	2.0 c-i
Confidor 200SL	1.8 fl. oz./A	42.5 bcd	1.5 cd	5.8 c-f	5.8 d-h	9.3 d-i	1.0 a-d	4.8 a-f	1.5 c-g	2.0 c-h
Calypso 4SC	0.751 fl. oz./A	36.3 bcd	0.3 cd	1.0 ghi	0.0 j	0.0 m	0.5 cd	6.5 a-e	1.8 a-g	1.0 d-i
Calypso 4SC	1.15 fl. oz./A	45.8 a-d	0.8 cd	0.0 i	0.5 ij	1.8 j-m	0.5 cd	5.3 a-f	0.5 fg	0.8 f-i
F0570 0.8EW	0.018 lb. a.i./A	39.0 bcd	1.8 cd	2.5 e-i	2.8 d-j	1.8 j-m	3.0 a-d	7.8 abc	3.3 a-e	3.0 a-e
F0570 0.8EW	0.025 lb. a.i./A	34.3 bcd	2.8 cd	1.0 ghi	3.0 d-j	1.0 klm	2.0 a-d	8 a-e	1.3 c-g	2.5 c-g
Warrior 1CS	54.34 g. a.i./A	36.3 bcd	0.0 d	1.0 ghi	0.0 j	0.3 lm	0.0 d	1.0 ef	4.3 a-d	4.5 a-d
Warrior 1CS	69.16 g. a.i./A	36.3 bcd	0.0 d	0.8 ghi	0.3 ij	0.0 m	0.0 d	0.8 ef	1.3 c-g	0.5 f-i
Warrior 1CS	83.98 g. a.i./A	23.3 cd	1.0 cd	1.0 ghi	0.5 ij	2.0 j-m	0.0 d	1.8 b-f	0.8 efg	1.0 d-i

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. (Continued). Colorado potato beetle large larvae sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean larvae per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Mustang 1.5EC	0.05 lb. a.i./A	34.8 bcd	1.5 cd	0.8 ghi	1.3 f-j	2.8 i-m	3.5 a-d	1.0 def	2.0 a-g	1.0 d-i
Thiodan 3EC	1.0 lb. a.i./A	35.0 bcd	0.8 cd	1.0 ghi	1.3 f-j	5.5 e-l	3.3 a-d	1.0 ef	2.0 a-g	1.3 d-i
YRC 2894 240SL	1.15 fl. oz./A	31.5 bcd	0.8 cd	0.8 ghi	1.5 f-j	5.3 e-k	2.5 a-d	1.3 b-f	0.3 fg	3.3 a-d
YRC 2894 240SL	1.5 fl. oz./A	29.3 bcd	0.5 cd	1.0 ghi	0.5 ij	3.0 h-m	0.5 cd	7.8 a-f	0.5 fg	1.0 e-i
YRC 2894 240SL	2.3 fl. oz./A	38.5 bcd	0.8 cd	1.0 ghi	0.8 hij	2.5 h-m	0.3 cd	3.3 b-f	0.8 efg	1.0 d-i
Spinosad 2SC	4.5 fl. oz./A	24.5 bcd	1.5 cd	0.8 ghi	0.0 j	1.5 j-m	3.0 a-d	1.5 b-f	0.5 fg	0.8 f-i
Avaunt 30DG + PBO	3.5 oz. wt./A + 4.0 fl. oz./A	19.0 d	3.5 cd	3.8 d-h	8.0 cd	31.0 ab	2.8 a-d	4.0 a-f	3.3 abc	2.5 b-f
Avaunt 30DG + Actara 25WG	3.5 oz. wt./A + 0.75 oz. wt./A	23.5 cd	0.5 cd	1.8 f-i	1.3 f-j	4.0 f-m	0.8 bcd	0.3 f	0.0 g	1.3 d-i
Avaunt 30DG + PBO	5.0 oz. wt./A + 4.0 fl. oz./A	35.5 bcd	0.0 d	3.3 d-i	12.3 bc	27.0 ab	3.0 a-d	6.0 a-f	2.0 a-g	1.3 c-i

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. (Continued). Colorado potato beetle large larvae sampled from Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean larvae per 10 plants								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Novaluron 0.83EC	0.039 lb. a.i./A	31.0 bcd	16.8 b	11.5 b	1.0 g-j	5.8 e-k	0.8 bcd	1.5 b-f	1.5 b-g	1.3 d-i
Novaluron 0.83EC	0.058 lb. a.i./A	21.3 d	16.0 b	9.0 bcd	2.8 d-j	0.8 klm	0.0 d	1.3 c-f	2.5 a-f	0.5 f-i
Novaluron 0.83EC	0.079 lb. a.i./A	24.8 d	15.5 b	12.0 bc	2.0 e-j	2.8 h-m	0.3 cd	3.8 a-f	1.3 c-g	0.5 ghi
V10112 20SG	20 g. a.i./A	33.0 bcd	2.8 cd	2.3 e-i	6.3 d-h	8.3 e-j	3.5 a-d	6.5 a-f	0.0 g	2.0 c-h
V10112 20SG + Silwet 100	20 g. a.i./A + 0.07 % v/v	36.5 bcd	3.8 c	2.3 e-i	3.3 d-j	19.0 bc	2.0 a-d	8.3 abc	0.3 fg	2.5 c-g
V10112 20SG	40 g. a.i./A	33.0 bcd	1.3 cd	2.3 e-i	2.5 d-j	6.5 e-j	6.5 abc	5.3 a-f	1.3 c-g	0.3 hi
Untreated	---	56.8 ab	72.0 a	69.5 a	56.5 a	42.3 a	8.3 a	2.0 b-f	1.5 c-g	2.0 c-h
V10112 20SG + Silwet 100	40 G A/A + 0.07 % v/v	65.5 a-d	0.5 cd	1.5 f-i	0.8 hij	12.0 cde	0.5 cd	8.5 a-d	0.0 g	1.3 c-i

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. Percent defoliation ratings of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean defoliation per plot								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Provado 1.6SC	1.8 fl. oz./A	5.0 a	6.3 ab	7.5 b	11.3 b	27.5 b	37.5 b	51.3 bc	62.5 bc	68.8 a-e
Provado 1.6SC	2.25 fl. oz./A	2.5 abc	2.5 bc	2.5 bc	3.8 cd	12.5 cde	20.0 c-f	35.0 b-f	47.5 b-g	62.5 b-h
Provado 1.6SC	3.75 fl. oz./A	1.3 bc	2.5 bc	2.5 bc	3.8 cd	11.3 cde	17.5 c-g	27.5 efg	27.5 fgh	51.3 b-i
Provado 75WG	1.0 oz. wt./A	2.5 abc	2.5 bc	0.0 c	5.0 bcd	10.0 cde	16.3 c-g	31.3 d-g	48.8 b-f	48.8 c-i
Baythroid 2E	1.6 fl. oz./A	1.3 bc	2.5 bc	2.5 bc	5.0 bcd	11.3 cde	16.3 c-g	30.0 d-g	40.0 c-h	41.3 e-i
Actara 25WG	1.5 oz. wt./A	1.3 bc	2.5 bc	5.0 bc	6.3 bcd	13.8 cd	16.3 c-g	28.8 efg	52.5 b-e	57.5 b-h
Leverage 2.7SE	3.75 fl. oz./A	2.5 abc	2.5 bc	2.5 bc	3.8 cd	10.0 cde	10.0 efg	21.3 efg	40.0 c-h	52.5 b-i
Actara 25WG	3.0 oz. wt./A	1.3 bc	2.5 bc	2.5 bc	3.8 cd	12.5 cde	15.0 c-g	26.3 efg	41.3 b-h	62.5 b-h
Asana XL 0.66EC	8.0 fl. oz./A	1.3 bc	1.3 c	2.5 bc	3.8 cd	10.0 cde	13.8 d-g	28.8 efg	40.0 c-h	55.0 b-h
Asana XL 0.66EC + PBO	8.0 fl. oz./A + 4.0 fl. oz./A	1.3 bc	2.5 bc	2.5 bc	3.8 cd	11.3 cde	15.0 c-g	37.5 b-e	42.5 b-h	66.3 b-g

Means in a column followed by the same letter are not significantly different.
(Least Significant Difference Test, P = 0.05).

Table 5. (Continued). Percent defoliation ratings of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean defoliation per plot								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Asana XL 0.66EC + Actara 25WG	6.0 fl. oz./A + 0.75 oz. wt./A	1.3 bc	2.5 bc	2.5 bc	3.8 cd	8.8 cde	11.3 efg	27.5 efg	43.8 b-h	66.3 b-g
Asana XL 0.66EC + Vydate 3.77SL	6 fl. oz./A + 1.0 pt./A	2.5 abc	1.3 c	2.5 bc	5.0 bcd	11.3 cde	13.8 d-g	23.8 efg	41.3 b-h	47.5 d-i
Confidor 200SL	1.8 fl. oz./A	1.3 bc	1.3 c	2.5 bc	3.8 cd	10.0 cde	12.5 d-g	23.8 efg	40.0 c-h	52.5 b-i
Calypso 4SC	0.751 fl. oz./A	0.0 c	0.0 c	1.3 c	2.5 cd	8.8 cde	13.8 d-g	23.8 efg	45.0 b-h	57.5 b-h
Calypso 4SC	1.15 fl. oz./A	1.3 bc	1.3 c	2.5 bc	5 bcd	10.0 cde	13.8 d-g	23.8 efg	40.0 c-h	55.0 b-h
F0570 0.8EW	0.018 lb. a.i./A	0.0 c	1.3 c	2.5 bc	3.8 cd	10.0 cde	12.5 d-g	30.0 d-g	41.3 b-h	57.5 b-h
F0570 0.8EW	0.025 lb. a.i./A	0.0 c	0.0 c	2.5 bc	3.8 cd	7.5 cde	10.0 efg	25.0 efg	41.3 b-h	50.0 c-i
Warrior 1CS	54.34 g. a.i./A	0.0 c	0.0 c	0.0 c	0.0 d	5.0 e	6.3 g	16.3 fg	25.0 gh	35.0 hi
Warrior 1CS	69.16 g. a.i./A	0.0 c	0.0 c	0.0 c	0.0d	5.0 e	6.3 g	12.5 g	23.8 h	38.8 ghi
Warrior 1CS	83.98 g. a.i./A	0.0 c	0.0 c	0.0 c	0.0 d	6.3 de	7.5 fg	12.5 g	25.0 gh	25.0 i

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. (Continued). Percent defoliation ratings of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean defoliation per plot								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Mustang 1.5EC	0.05 lb. a.i./A	0 c	0 c	0 c	0 d	5 e	7.5 fg	16.3 fg	35.0 d-h	38.8 ghi
Thiodan 3EC	1.0 lb. a.i./A	1.3 bc	1.3 c	3.8 bc	2.5 cd	10.0 cde	22.5 cde	31.3 d-g	46.3 b-h	67.5 a-f
YRC 2894 240SL	1.15 fl. oz./A	0.0 c	0.0 c	0.0 c	0.0 d	7.5 cde	15.0 c-g	22.5 efg	35.0 d-h	42.5 e-i
YRC 2894 240SL	1.5 fl. oz./A	0.0 c	0.0 c	0.0 c	2.5 cd	6.3 de	17.5 c-g	23.8 efg	36.3 d-h	41.3 e-i
YRC 2894 240SL	2.3 fl. oz./A	0.0 c	0.0 c	1.3 c	2.5 cd	6.3 de	15.0 c-g	20.0 efg	40.0 c-h	45.0 e-i
Spinosad 2SC	4.5 fl. oz./A	0.0 c	0.0 c	0.0 c	1.3 cd	5.0 e	15.0 c-g	27.5 efg	37.5 d-h	48.8 c-i
Avaunt 30DG + PBO	3.5 oz. wt./A + 4.0 fl. oz./A	0.0 c	0.0 c	0.0 c	0.0 d	15.0 c	27.5 bc	52.5 b	63.8 b	75.0 a-d
Avaunt 30DG + Actara 25WG	3.5 oz. wt./A + 0.75 oz. wt./A	0.0 c	0.0 c	0.0 c	0.0 d	8.8 cde	12.5 d-g	20.0 efg	33.8 d-h	40.0 f-i
Avaunt 30DG + PBO	5.0 oz. wt./A + 4.0 fl. oz./A	0.0 c	1.3 c	1.3 c	3.8 cd	12.5 cde	27.5 bc	48.8 bcd	63.8 b	76.3 abc

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. (Continued). Percent defoliation ratings of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Mean defoliation per plot								
		6-24	6-26	6-28	7-2	7-8	7-17	7-24	8-1	8-7
Novaluron 0.83EC	0.039 lb. a.i./A	0.0 c	0.0 c	0.0 c	1.3 cd	10.0 cde	11.3 efg	32.5 c-f	42.5 b-h	51.3 b-i
Novaluron 0.83EC	0.058 lb. a.i./A	0.0 c	0.0 c	0.0 c	0.0 d	7.5 cde	13.8 d-g	25.0 efg	27.5 fgh	46.3 e-i
Novaluron 0.83EC	0.079 lb. a.i./A	0.0 c	0.0 c	0.0 c	1.3 cd	10.0 cde	17.5 c-g	22.5 efg	31.3 e-h	43.8 e-i
V10112 20SG	20 g. a.i./A	0.0 c	0.0 c	0.0 c	0.0 d	11.3 cde	13.8 d-g	28.8 efg	45.0 b-h	57.5 b-h
V10112 20SG + Silwet 100	20 g. a.i./A + 0.07 % v/v	0.0 c	0.0 c	0.0 c	1.3 cd	10.0 cde	20.0 c-f	36.3 b-e	56.3 bcd	78.8 ab
V10112 20SG	40 g. a.i./A	0.0 c	0.0 c	0.0 c	2.5 cd	11.3 cde	20.0 c-f	37.5 b-e	62.5 bc	63.8 b-g
Untreated	---	3.8 ab	10.0 a	15.0 a	40.0 a	77.5 a	87.5 a	93.8 a	95.0 a	95.0 a
V10112 20SG + Silwet 100	40 G A/A + 0.07 % v/v	2.5 abc	2.5 bc	5.0 bc	7.5 bc	13.8 cd	25.0 bcd	33.8 b-f	55.0 bcd	78.8 ab

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 6. Yield and percent grade of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Percent grade		Total yield (cwt/A)
		A's	B's & Culls	
Provado 1.6SC	1.8 fl. oz./A	85.2 ab	14.8 ef	226.9 a-e
Provado 1.6SC	2.25 fl. oz./A	76.5 de	23.5 bc	212.4 def
Provado 1.6SC	3.75 fl. oz./A	82.2 a-d	17.8 c-f	240.9 a-e
Provado 75WG	1.0 oz. wt./A	77.8 cde	22.2 bcd	249.1 a-e
Baythroid 2E	1.6 fl. oz./A	73.6 e	26.4 b	221.4 c-f
Actara 25WG	1.5 oz. wt./A	78.9 b-e	21.0 b-e	277.2 ab
Leverage 2.7SE	3.75 fl. oz./A	80.6 a-d	19.4 c-f	232.3 a-e
Actara 25WG	3.0 oz. wt./A	80.3 a-d	19.7 c-f	266.3 a-d
Asana XL 0.66EC	8.0 fl. oz./A	81.0 a-d	18.9 c-f	252.3 a-e
Asana XL 0.66EC + PBO	8.0 fl. oz./A + 4.0 fl. oz./A	83.3 abc	16.6 def	250.0 a-e
Asana XL 0.66EC + Actara 25WG	6.0 fl. oz./A + 0.75 oz. wt./A	81.3 a-d	18.7 c-f	259.1 a-e
Asana XL 0.66EC + Vydate 3.77SL	6 fl. oz./A + 1.0 pt./A	80.1 a-d	19.9 c-f	239.6 a-e
Confidor 200SL	1.8 fl. oz./A	80.5 a-d	19.5 c-f	254.6 a-e
Calypso 4SC	0.751 fl. oz./A	80.3 a-d	19.7 c-f	251.8 a-e
Calypso 4SC	1.15 fl. oz./A	83.3 abc	16.7 def	230.9 a-e

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 6. (Continued). Yield and percent grade of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Percent grade		Total yield (cwt/A)
		A's	B's & Culls	
F0570 0.8EW	0.018 lb. a.i./A	81.2 a-d	18.9 c-f	231.9 a-e
F0570 0.8EW	0.025 lb. a.i./A	79.9 b-e	20.2 b-e	259.1 a-e
Warrior 1CS	54.34 g. a.i./A	83.8 abc	16.2 def	260.0 a-e
Warrior 1CS	69.16 g. a.i./A	83.5 abc	16.5 def	269.1 abc
Warrior 1CS	83.98 g. a.i./A	82.0 a-d	17.9 c-f	262.7 a-e
Mustang 1.5EC	0.05 lb. a.i./A	81.6 a-d	18.3 c-f	253.2 a-e
Thiodan 3EC	1.0 lb. a.i./A	84.8 ab	15.2 ef	257.3 a-e
YRC 2894 240SL	1.15 fl. oz./A	81.2 a-d	18.7 c-f	232.3 a-e
YRC 2894 240SL	1.5 fl. oz./A	79.4 b-e	20.6 b-e	262.3 a-e
YRC 2894 240SL	2.3 fl. oz./A	82.6 a-d	17.5 c-f	234.6 a-e
Spinosad 2SC	4.5 fl. oz./A	80.3 a-d	19.7 c-f	220.5 c-f
Avaunt 30DG + PBO	3.5 oz. wt./A + 4.0 fl. oz./A	80.0 a-e	20.0 b-f	239.6 a-e
Avaunt 30DG + Actara 25WG	3.5 oz. wt./A + 0.75 oz. wt./A	85.2 ab	14.8 ef	270.4 abc
Avaunt 30DG + PBO	5.0 oz. wt./A + 4.0 fl. oz./A	86.5 a	13.5 f	259.1 a-e

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 6. (Continued). Yield and percent grade of Superior variety potatoes treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Percent grade		Total yield (cwt/A)
		A's	B's & Culls	
Novaluron 0.83EC	0.039 lb. a.i./A	85.0 ab	15.0 ef	260.5 a-e
Novaluron 0.83EC	0.058 lb. a.i./A	81.8 a-d	18.2 c-f	264.1 a-d
Novaluron 0.83EC	0.079 lb. a.i./A	82.7 a-d	17.3 c-f	263.6 a-d
V10112 20SG	20 g. a.i./A	83.0 abc	17.0 def	264.5 a-d
V10112 20SG + Silwet 100	20 g. a.i./A + 0.07 % v/v	83.3 abc	16.7 def	280.4 a
V10112 20SG	40 g. a.i./A	79.3 b-e	20.7 b-e	208.3 ef
Untreated	---	65.6 f	34.4 a	170.6 f
V10112 20SG + Silwet 100	40 G A/A + 0.07 % v/v	80.9 a-d	19.1 c-f	222.8 b-f

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Part 2. Insect Control with Foliar Insecticides.

C. Colorado Potato Beetle Control with Registered and Experimental Insecticides-Hancock.

Plots consisting of two 20' rows of Russet Burbank variety potatoes were planted on April 24 with four replicates of 24 treatments arranged in a randomized complete block experimental design. Plots were separated by two untreated potato border rows and replicates were 15' apart. Plots were managed according to commercial potato production for disease and weed control. Plots were also hand weeded as necessary to maintain weed control.

Four registered and eight non-registered materials were evaluated at the following rates.

Registered: Provado 1.6SC (0.047 lb. a.i./A), Baythroid 2E/PBO (0.025 lb. a.i./A/4 fl. oz./A), Actara 25WG (0.023 and 0.047 lb. a.i./A), and Spintor 2SC (0.07 lb. a.i./A).

Experimental: Provado 75WG (0.047 lb. a.i./A), Confidor 200SL (0.023 lb. a.i./A), Calypso 4SC (0.023 and 0.047 lb. a.i./A), FO570 0.8EW (0.018 and 0.025 lb. a.i./A), YRC 2894 240SL (0.018, 0.023, and 0.036 lb. a.i./A), Warrior 1CS (0.025 lb. a.i./A), Novaluron 0.83EC (0.039, 0.058, and 0.079 lb. a.i./A), V10112 20SG (20 g a.i./A with and without 0.07% v/v and 40 g. a.i./A with and without silwet 0.07% v/v), and Capture 2E (0.10 lb. a.i./A).

All materials were applied with a CO_2 backpack sprayer operating at 38 psi delivering 20 gpa through four flat fan nozzles (XR8002) spaced at 18".

Insecticides were applied on June 18 and 24 for first generation larval control and plots were evaluated at 3 and 8 days after the first application (June 18) and at 4, 8 and 16 days after the second application (June 24). Colorado potato beetle (CPB) populations were monitored by plant counts. All life stages of the CPB were counted on ten randomly chosen plants per plot. CPB pressure was extremely high compared to past seasons and pressure was uniform across all

replications. Plant foliage defoliation ratings were taken on each survey date from June 24 through July 10.

The plots were not harvested because only first generation CPB populations were managed.

RESULTS

Colorado potato beetle adults entered the plots in late May and early June, after potato emergence and began laying egg masses. First generation CPB adult and egg mass numbers peaked before insecticide applications on June 18 and numbers were declining in the plots during the first CPB survey on June 19 (Table 1 and 2). CPB adult and egg mass numbers continued to decline throughout the study during the rest of June and the first week of July when second generation adults emerged from pupation. Second generation adult pressure in combination with larval pressure totally defoliated the untreated plots by the middle of July when CPB surveys were ceased (Table 5).

Insecticide applications were timed to coincide with peak numbers of small larvae and limited numbers of large larvae. Small larval numbers peaked in the untreated plots on June 19 at 23.4 larvae per plant (Table 3). Small larval numbers steadily declined in the untreated plots until the end of the study on July 10. CPB large larval numbers peaked in the untreated plots on June 24, one week after the small larval peak, at 40.3 larvae per plant (Table 4). Large larval numbers steadily declined until the end of the study on July 10. Plant defoliation in the untreated plots progressed from 12.5 percent on June 19 to 92.5 percent on July 10, indicating the high CPB adult and larval pressure in the plots (Table 5).

CPB adults are typically difficult to control and are not usually targeted for control. Adult numbers were reduced in many of the treated plots after applications on June 18 but by June 24 adult numbers had significantly increased throughout the study (Table 1). Adult numbers also declined after the second insecticide applications on June 24.

Egg mass numbers were similar among all the treatments (there were no ovicides used in the study) and there were few significant differences among them (Table 2).

Small larval numbers were significantly reduced in all the treatments after the first insecticide application on June 18 (Table 3). Most of the insecticide treatments performed equally well, however the spinosad treatment and middle and lowest rate of Novaluron had slightly higher numbers of small larvae. Six days after the first insecticide application (June 24), small larval numbers had increased throughout the treated plots due to hatching egg masses and insecticide treatments were reapplied. Small larval numbers were reduced in all the plots on June 28 as a result of insecticide applications and larval progression into larger instars. Similar efficacy trends occurred after the second insecticide applications on June 24. Effectiveness was similar among most of the treatments while small larval numbers were highest in the Baythroid, Warrior, and Novaluron treatments. Eight days after the second insecticide application on June 24, small larval numbers had again increased in many of the treated plots.

Large larval numbers were significantly reduced in many of the treated plots after the first insecticide application on June 18 (Table 4). The Spintor and middle and lowest rate of Novaluron treatments had larval numbers significantly higher than the other treatments. Six days after the initial insecticide applications, large larval numbers had significantly increased throughout the study. Large larval numbers were significantly lower in all the treated plots with Actara and Calypso were providing the most efficacies. Insecticide applications on June 24 reduced large larval numbers in all the treatments but they were not as effective as the first application. Actara provided the most effective control after application and continued to limit large larval numbers for 16 days after application.

Foliage defoliation is often reflective of how effective CPB treatments are during the season. Defoliation ratings in many of the plots were limited to less than 10 percent during June, indicating effective larval control even under high insect pressure (Table 5). Defoliation in the plots increased during early July and

the untreated plots were completely defoliated shortly after the final survey on July 10. Potato plants can tolerate 20 percent defoliation during July before suffering yield loss and many of the neonicotinyl treatments (at higher rates) provided sufficient protection. Novaluron at the high rate, and Warrior also limited foliage defoliation to acceptable levels.

Table 1. Colorado potato beetle adults sampled from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate (lb. a.i./A)	Mean adults per 10 plants				
		6-19	6-24	6-28	7-2	7-10
UTC	---	3.3 ab	0.5 f	0.0 g	1.5 ab	41.5 bcd
Provado 1.6F	0.047	0.0 f	12.3 a	2.8 b-e	2.5 ab	85.0 b
Provado 75WG	0.047	0.8 def	11.5 ab	6.0 abc	4.5 a	209.3 a
Baythroid 2E/PBO	0.025/4 fl. oz./A	1.5 a-f	7.5 a-e	1.5 d-g	2.3 ab	58.8 bcd
Actara 25WG	0.023	1.5 b-f	11.8 a	2.3 d-g	2.5 ab	79.8 b
Actara 25WG	0.047	0.3 ef	6.8 a-e	1.0 efg	3.8 ab	69.0 bc
Confidor 200SL	0.023	3.0 abc	9.5 a-e	2.0 d-g	1.8 ab	78.5 b
Calypso 240SL	0.023	0.8 def	4.0 def	0.8 efg	2.3 ab	49.5 bcd
Calypso 240SL	0.047	1.3 c-f	9.0 a-d	3.5 b-e	3.8 ab	22.0 d
FO570 0.8EW	0.018	0.8 def	3.3 def	0.3 fg	2.8 ab	56.8 bcd
FO570 0.8EW	0.025	1.0 def	12.0 abc	2.0 d-g	3.5 ab	69.3 bcd

Means in a column followed by the same letter are not significantly different. (Least Significant Difference Test, P = 0.05).

Table 1. (Continued). Colorado potato beetle adults sampled from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate	Mean adults per 10 plants				
		6-19	6-24	6-28	7-2	7-10
YRC 2894 2SC	0.018	1.3 b-f	11.3 abc	4.5 a-d	4.0 ab	69.3 bcd
YRC 2894 2SC	0.023	0.5 def	7.0 a-e	6.5 ab	2.8 ab	51.8 bcd
YRC 2894 2SC	0.036	1.5 a-f	6.8 a-e	3.0 b-e	2.0 ab	68.0 bc
Warrior 1CS	0.025	1.0 def	6.0 a-e	7.8 a	1.5 ab	29.8 cd
Spintor 2SC	0.070	3.8 a	4.5 cde	2.8 b-e	2.0 ab	45.0 bcd
Novaluron 0.83EC	0.039	2.0 a-e	5.8 a-e	3.5 b-e	2.0 ab	77.8 b
Novaluron 0.83EC	0.058	2.5 a-e	4.8 cde	1.8 d-g	1.5 b	62.8 bcd
Novaluron 0.83EC	0.079	0.5 def	3.3 ef	1.3 d-g	2.8 ab	53.8 bcd
V10112 20SG	20 g. a.i./A	2.0 a-d	5.3 b-e	1.5 d-g	1.8 ab	62.5 bcd
V10112 20SG/silwet	20 g. a.i./A/0.07%	1.0 def	6.8 a-e	2.3 c-f	1.5 ab	80.8 b
V10112 20SG	40 g. a.i./A	1.0 def	12.8 a	2.0 c-g	2.0 ab	66.5 bcd
V10112 20SG/silwet	40 g. a.i./A/0.07%	0.5 def	5.3 a-e	2.8 b-e	2.3 ab	79.0 b
Capture 2EC	0.10 lb. a.i./A	1.3 b-f	11.3 abc	4.5 a-d	4.0 ab	69.3 bcd

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 2. Colorado potato beetle egg masses sampled from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate (lb. a.i./A)	Mean egg masses per 10 plants				
		6-19	6-24	6-28	7-2	7-10
UTC	---	3.0 a-d	1.5 ab	0.0 d	0.0 b	0.0 b
Provado 1.6F	0.047	2.8 a-d	4.0 ab	1.8 a-d	1.3 a	0.0 b
Provado 75WG	0.047	1.3 cd	5.5 a	1.3 a-d	0.5 ab	0.0 b
Baythroid 2E/PBO	0.025/4 fl. oz./A	3.0 a-d	1.5 ab	0.8 a-d	0.3 ab	0.5 ab
Actara 25WG	0.023	3.3 a-d	1.5 ab	0.5 bcd	0.5 ab	0.0 b
Actara 25WG	0.047	1.0 d	1.8 ab	0.5 bcd	0.0 b	0.5 ab
Confidor 200SL	0.023	5.0 abc	2.3 ab	0.8 a-d	0.3 ab	0.3 ab
Calypso 240SL	0.023	1.3 cd	1.5 ab	3.3 a	0.3 ab	0.8 a
Calypso 240SL	0.047	2.3 bcd	1.3 ab	2.0 a-d	0.8 ab	0.0 b
FO570 0.8EW	0.018	5.8 a	2.0 ab	0.0 d	0.3 ab	0.0 b
FO570 0.8EW	0.025	2.5 bcd	2.8 ab	2.5 abc	0.0 b	0.0 b

Means in a column followed by the same letter are not significantly different. (Least Significant Difference Test, P = 0.05).

Table 2. (Continued). Colorado potato beetle egg masses sampled from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate	Mean egg masses per 10 plants				
		6-19	6-24	6-28	7-2	7-10
YRC 2894 2SC	0.018	5.0 ab	1.5 ab	2.0 a-d	0.5 ab	0.0 b
YRC 2894 2SC	0.023	3.5 a-d	2.0 ab	1.0 a-d	0.3 ab	0.0 b
YRC 2894 2SC	0.036	2.0 bcd	3.3 ab	1.0 a-d	0.5 ab	0.0 b
Warrior 1CS	0.025	3.8 a-d	2.5 ab	1.5 a-d	0.5 ab	0.0 b
Spintor 2SC	0.070	5.5 abc	0.8 b	0.5 bcd	0.8 ab	0.0 b
Novaluron 0.83EC	0.039	2.8 a-d	2.3 ab	1.8 a-d	0.3 ab	0.3 ab
Novaluron 0.83EC	0.058	3.3 a-d	1.3 ab	1.5 a-d	0.8 ab	0.3 ab
Novaluron 0.83EC	0.079	2.5 bcd	1.0 b	0.3 cd	0.5 ab	0.0 b
V10112 20SG	20 g. a.i./A	2.0 bcd	1.5 ab	1.5 a-d	0.0 b	0.0 b
V10112 20SG/silwet	20 g. a.i./A/0.07%	3.0 a-d	3.5 ab	3.3 ab	0.0 b	0.0 b
V10112 20SG	40 g. a.i./A	4.3 ab	2.3 ab	1.5 a-d	0.0 b	0.0 b
V10112 20SG/silwet	40 g. a.i./A/0.07%	3.7 a-d	2.3 ab	0.7 a-d	0.0 b	0.0 b
Capture 2EC	0.10 lb. a.i./A	5.0 ab	1.5 ab	2.0 a-d	0.5 ab	0.0 b

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 3. Colorado potato beetle small larvae sampled from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate (lb. a.i./A)	Mean larvae per 10 plants				
		6-19	6-24	6-28	7-2	7-10
UTC	---	233.8 a	74.3 abc	12.3 a	4.0 ij	0.0 a
Provado 1.6F	0.047	9.0 c	26.8 c-g	2.0 c-f	28.5 ab	3.8 a
Provado 75WG	0.047	8.0 c	19.0 fg	1.5 c-f	11.3 d-i	0.0 a
Baythroid 2E/PBO	0.025/4 fl. oz./A	15.8 c	44.3 c-f	9.0 ab	16.8 a-f	0.0 a
Actara 25WG	0.023	15.5 c	21.3 efg	0.5 ef	3.8 hij	2.5 a
Actara 25WG	0.047	11.8 c	10.0 g	0.0 f	0.0 j	0.0 a
Confidor 200SL	0.023	8.3 c	59.0 a-e	4.5 b-f	6.0 f-j	3.0 a
Calypso 240SL	0.023	8.3 c	50.0 a-f	0.0 f	17.5 a-f	1.0 a
Calypso 240SL	0.047	6.3 c	25.3 d-g	1.8 c-f	13.3 a-g	5.5 a
FO570 0.8EW	0.018	18.0 c	53.8 a-f	2.5 b-f	12.0 b-h	0.0 a
FO570 0.8EW	0.025	20.8 c	24.3 d-g	3.5 b-f	30.0 a	0.0 a

Means in a column followed by the same letter are not significantly different. (Least Significant Difference Test, P = 0.05).

Table 3. (Continued). Colorado potato beetle small larvae sampled from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate	Mean larvae per 10 plants				
		6-19	6-24	6-28	7-2	7-10
YRC 2894 2SC	0.018	19.0 c	152.5 a	2.0 c-f	18.3 a-e	0.5 a
YRC 2894 2SC	0.023	7.5 c	29.5 c-g	0.3 ef	10.8 c-i	3.5 a
YRC 2894 2SC	0.036	16.0 c	15.5 fg	1.8 c-f	23.0 abc	0.0 a
Warrior 1CS	0.025	14.0 c	38.0 c-g	5.3 a-e	22.5 a-d	1.3 a
Spintor 2SC	0.070	92.8 b	46.3 c-f	3.8 b-f	8.0 e-i	3.3 a
Novaluron 0.83EC	0.039	134.5 ab	36.5 c-g	5.0 a-d	11.8 c-i	1.8 a
Novaluron 0.83EC	0.058	87.3 b	33.5 c-g	7.0 abc	6.3 g-j	0.8 a
Novaluron 0.83EC	0.079	15.8 c	108.8 ab	6.3 a-d	8.8 d-i	0.0 a
V10112 20SG	20 g. a.i./A	19.3 c	64.3 a-d	4.8 b-f	13.0 b-h	1.3 a
V10112 20SG/silwet	20 g. a.i./A/0.07%	19 c	42.8 c-f	0.0 f	2.5 ij	0.0 a
V10112 20SG	40 g. a.i./A	23.5 c	42.5 c-g	1.5 c-f	0.0 j	4.0 a
V10112 20SG/silwet	40 g. a.i./A/0.07%	21.0 c	47.5 c-f	2.5 b-f	20.3 a-e	0.0 a
Capture 2EC	0.10 lb. a.i./A	19.0 c	152.5 a	2.0 c-f	18.3 a-e	0.5 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 4. Colorado potato beetle large larvae sampled from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate (lb. a.i./A)	Mean larvae per 10 plants				
		6-19	6-24	6-28	7-2	7-10
UTC	---	86.8 ab	403.0 a	172.8 a	58.8 ab	27.3 gh
Provado 1.6F	0.047	1.5 c	56.3 g-l	36.5 c-g	36.8 b-e	101.5 a
Provado 75WG	0.047	0.8 c	47.8 i-l	11.5 hi	17.8 efg	49.5 c-f
Baythroid 2E/PBO	0.025/4 fl. oz./A	3.5 c	149.5 bcd	67.3 b	68.8 a	72.5 a-d
Actara 25WG	0.023	7.8 c	135.0 d-i	9.5 hi	7.0 gh	45.0 d-g
Actara 25WG	0.047	1.5 c	18.8 l	4.5 i	2.5 h	26.0 h
Confidor 200SL	0.023	4.5 c	106.3 c-g	20.5 fgh	29.3 b-f	31.5 fgh
Calypso 240SL	0.023	0.5 c	59.5 f-k	12.0 ghi	20.0 c-g	74.8 abc
Calypso 240SL	0.047	0.0 c	26 kl	8.8 hi	32.0 b-f	85.8 ab
FO570 0.8EW	0.018	1.5 c	183.8 b	56.0 bc	67.3 a	73.5 a-d
FO570 0.8EW	0.025	2.5 c	112.0 b-f	44.3 bcd	42.8 bcd	71.8 a-d

Means in a column followed by the same letter are not significantly different. (Least Significant Difference Test, P = 0.05).

Table 4. (Continued). Colorado potato beetle large larvae sampled from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate	Mean larvae per 10 plants				
		6-19	6-24	6-28	7-2	7-10
YRC 2894 2SC	0.018	0.8 c	70.8 e-j	19.8 d-h	53.0 ab	68.8 a-e
YRC 2894 2SC	0.023	2.0 c	52.3 h-l	9.8 hi	19.8 c-g	67.0 a-e
YRC 2894 2SC	0.036	6.0 c	98.5 c-h	41.3 b-f	20.5 c-g	70.3 a-e
Warrior 1CS	0.025	5.5 c	36.3 jkl	23.0 e-h	33.5 b-f	59.3 b-e
Spintor 2SC	0.070	80.5 ab	59.0 f-k	42.5 bcd	19.5 c-g	51.0 c-f
Novaluron 0.83EC	0.039	129.0 a	69.5 e-j	42.5 bcd	11.0 gh	33.5 fgh
Novaluron 0.83EC	0.058	63.5 b	49.3 i-l	44.0 b-f	10.5 gh	50.8 c-f
Novaluron 0.83EC	0.079	6.5 c	166.8 bc	62.5 b	52.5 ab	57.8 b-e
V10112 20SG	20 g. a.i./A	5.8 c	117.8 b-f	48.5 bc	47.5 ab	42.5 e-h
V10112 20SG/silwet	20 g. a.i./A/0.07%	2.5 c	93.0 c-i	17.3 ghi	13.0 fgh	48.5 c-f
V10112 20SG	40 g. a.i./A	5.3 c	91.3 d-i	13.8 ghi	17.3 d-g	76.3 a-d
V10112 20SG/silwet	40 g. a.i./A/0.07%	4.5 c	160.0 bc	67.3 b	44.8 abc	84.5 ab
Capture 2EC	0.10 lb. a.i./A	0.8 c	70.8 e-j	19.8 d-h	53.0 ab	68.8 a-e

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Table 5. Percent defoliation ratings from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate (lb. a.i./A)	Mean percent defoliation per plot				
		6-19	6-24	6-28	7-2	7-10
UTC	---	12.5 a	22.5 a	55.0 a	82.5 a	92.5 a
Provado 1.6F	0.047	5.0 b	3.8 c	5.0 bc	5.0 efg	21.3 c-f
Provado 75WG	0.047	2.5 b	3.8 c	3.8 bc	2.5 g	17.5 c-f
Baythroid 2E/PBO	0.025/4 fl. oz./A	2.5 b	2.5 c	5.0 bc	12.5 bc	37.5 bcd
Actara 25WG	0.023	3.8 b	6.3 bc	7.5 bc	7.5 c-g	11.3 ef
Actara 25WG	0.047	6.3 b	1.3 c	2.5 c	3.8 fg	7.5 f
Confidor 200SL	0.023	5.0 b	2.5 c	3.8 bc	3.8 fg	18.8 c-f
Calypso 240SL	0.023	2.5 b	1.3 c	2.5 c	3.8 fg	21.3 c-f
Calypso 240SL	0.047	2.5 b	3.8 c	2.5 c	3.8 fg	15.0 c-f
FO570 0.8EW	0.018	2.5 b	6.3 bc	6.3 bc	13.8 b	40.0 bc
FO570 0.8EW	0.025	3.8 b	5.0 bc	7.5 bc	11.3 bcd	35.0 b-e

Means in a column followed by the same letter are not significantly different. (Least Significant Difference Test, P = 0.05).

Table 5. (Continued). Percent defoliation ratings from Russet Burbank variety potatoes treated with foliar insecticides. Hancock, WI 2002.

Treatment	Rate	Mean percent defoliation per plot				
		6-19	6-24	6-28	7-2	7-10
YRC 2894 2SC	0.018	3.8 b	2.5 c	2.5 c	3.8 fg	20.0 c-f
YRC 2894 2SC	0.023	3.8 b	2.5 c	3.8 bc	5.0 efg	12.5 def
YRC 2894 2SC	0.036	6.3 b	3.8 c	6.3 bc	5.0 efg	31.3 b-f
Warrior 1CS	0.025	3.8 b	6.3 bc	3.8 bc	5.0 efg	13.8 def
Spintor 2SC	0.070	3.8 b	6.3 bc	5.0 bc	11.3 bcd	30.0 b-f
Novaluron 0.83EC	0.039	6.3 b	6.3 bc	8.8 bc	8.8 b-f	26.3 c-f
Novaluron 0.83EC	0.058	6.3 b	6.3 bc	6.3 bc	6.3 d-g	25.0 c-f
Novaluron 0.83EC	0.079	5.0 b	3.8 c	5.0 bc	11.3 bcd	20.0 c-f
V10112 20SG	20 g. a.i./A	5.0 b	5.0 bc	7.5 bc	10.0 b-e	52.5 b
V10112 20SG/silwet	20 g. a.i./A/0.07%	3.8 b	2.5 c	2.5 c	5.0 efg	27.5 b-f
V10112 20SG	40 g. a.i./A	3.8 b	5.0 bc	2.5 c	2.5 g	15.0 c-f
V10112 20SG/silwet	40 g. a.i./A/0.07%	3.8 b	12.5 b	10.0 b	12.5 bc	40.0 bc
Capture 2EC	0.10 lb. a.i./A	3.8 b	2.5 c	2.5 c	3.8 fg	20.0 c-f

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05).

Part 2. Insect Control with Foliar Insecticides.

D. Aphid Control with Foliar Insecticides, Arlington, WI 2002.

Aphid control is frequently necessary in fresh market and processing potato production to avoid direct damage from aphid feeding and to prevent transmission of potato leaf roll virus that can reduce raw product quality due to tuber net necrosis. Both green peach and to a lesser extent potato aphids are important vectors in this regard and although thresholds for treatment vary, treatments are usually applied when populations exceed one per leaf in samples consisting of twenty-five leaves.

In 2002 an experiment was established at the Arlington Experimental Station to examine the efficacy of foliar insecticides in aphid control.

Plots consisting of 2 rows x 60' of Superior variety potatoes were planted on April 30. Rows were planted on 3' centers and plants were 12" apart. Plots were separated by 9' of unplanted alleyway and 12' between replications. Weed and disease control programs were as per commercial standard. All plots were sprayed with Mtrak at 2 qt./A on June 24 for Colorado potato beetle control. All plots were sprayed with Sevin at 1 qt. pr./A on June 25, July 9, 16, and 24 to reduce potato leafhopper and beneficial arthropod populations. Aphid populations were allowed to increase naturally until both green peach and potato aphid numbers were at high levels. Infestation levels were monitored by removal of 20 mid plant leaves per rep and counting green peach and potato aphids. Aphid pressure was light until late July when numbers peaked on July 31. A foliar application was made on July 31 and a one-day post application aphid count was made on August 1 before aphid numbers crashed throughout the study and no further counts were taken.

The following treatments were evaluated:

Registered:	Monitor 4E (2 pt. pr./A); Provado 1.6F (3.75 fl. oz./A); Actara 25WG (1.5 and 3.0 oz./A); Fulfill 50WG (2.75 oz./A).
Experimental:	Provado 75WG (1 oz./A); Confidor 200SL (3.6 fl. oz./A); Calypso 4SC (1.5 and 3.0 fl. oz./A); YRC 2894 240SL (2.3 and

3.0 fl. oz./A); F 1785 50DF (0.018, 0.036, 0.053, and 0.071 lb. a.i./A); Assail 70WP (0.05 lb. a.i./A).

Treatments were applied with a tractor-mounted compressed air, boom sprayer operating at 40 psi delivering 22 gpa through five flat fan nozzles (TeeJet XR8002) spaced at 18".

Results

Aphid populations were at very low levels in the study during June and much of July and peaked during late July (Table 1). Aphid numbers were at high levels throughout the study at the time of application and are evident from the aphid numbers found in the untreated plots one-day post application. Green peach aphid numbers were considerably higher than potato aphid numbers in the untreated plots. All of the insecticides evaluated reduced aphid numbers, however since only a one-day post application survey was done only initial efficacy can be determined. Unfortunately a couple of the insecticides evaluated are more slow acting (Fulfill and F1785) and their true effectiveness of aphid control was not demonstrated. All of the aphicides tested significantly reduced green peach and potato aphid numbers after application and all treatments had significantly fewer aphids than the untreated plots. Monitor was clearly the most effective aphicide for “knock down” control while the neonicotinyls were also effective. Fulfill and F 1785 are slower acting aphicides but they still significantly reduced aphid numbers.

Table 1. Aphids sampled from Superior potatoes treated with various foliar insecticides. Entomology Research Station, Arlington, WI 2002.

Treatment	Rate	Mean aphids per 20 leaves	
		Green peach	Potato aphids
Provado 1.6SC	3.75 fl. oz./A	21.8 fg	1.5 ef
Provado 75WG	1.0 oz./A	20.0 fg	2.8 ef
Confidor 200SL	3.6 fl. oz./A	39.5 efg	4.0 def
Calypso 4SC	1.5 fl. oz./A	66.0 def	9.8 b-e
Calypso 4SC	3.0 fl. oz./A	35.0 efg	1.5 ef
YRC 2894 240SL	2.3 fl. oz./A	77.5 def	6.8 b-f
YRC 2894 240SL	3.0 fl. oz./A	42.8 efg	4.0 def
Actara 25WG	1.5 oz./A	32.3 fg	5.5 c-f
Actara 25WG	3.0 oz./A	23.8 fg	1.0 ef
Fulfill 50WG	2.75 oz./A	221.8 bc	18.8 b
Monitor 4E	2 pt./A	4.0 g	0.0 f
F 1785 50DF	0.018 lb. a.i./A	310.8 b	15.0 bcd
F 1785 50DF	0.036 lb. a.i./A	142.0 cde	15.0 bcd
F 1785 50DF	0.053 lb. a.i./A	176.3 bcd	15.0 bcd
F 1785 50DF	0.071 lb. a.i./A	193.8 bcd	18.8 bc
Assail 70WP	0.05 lb. a.i./A	21.5 fg	4.3 def
Untreated	---	758.8 a	58.5 a

Means in a column followed by the same letter are not significantly different (Least Significant Difference Test, P = 0.05)

Section II. Insect Control on Cabbage.

A. Control of Lepidopteran larvae with Foliar Insecticides. Arlington.

Several lepidopteran species are serious larval pests in commercial cabbage production in Wisconsin. Larvae of the diamondback moth (DBM), *Plutela xylostella* (L.), the imported cabbage worm (ICW), *Artogiea rapae* (L.), and the cabbage looper (CL), *Trichoplusia ni* (Hubner), are pests in cabbage that require control annually.

Diamondback moths are present on cabbage early in spring and during summer, frequently requiring control in both seedbeds and on early transplants. Registered insecticides have effectively controlled DBM larvae in the past, however insecticide resistance has become an issue in recent years in Wisconsin due to importation of resistant larvae on southern transplants. An ichneumonid wasp, *Diadegma insulare* (Cresson) DBM larvae can also effectively control larvae. Imported cabbageworm larvae normally occur in June, July, and August. ICW larvae can cause severe foliage and head damage and require control on both fresh market and kraut cabbage and on other commercial crucifers such as broccoli and cauliflower. Imported cabbageworm larvae are effectively controlled by a wide range of registered insecticides. The cabbage looper is a migratory pest. Cabbage looper adults migrate into Wisconsin from the south and give rise to two or three larval generations per season. Peak cabbage looper larval activity occurs in mid August and into the fall and the larvae can be difficult to control. If cabbage looper larvae are uncontrolled, severe economic losses can occur.

Blue Vantage variety cabbage transplants (85 day maturity), purchased from Funk Farms Inc. Racine, WI, were planted on June 20. Treatments consisted of two 80’ rows on 3’ centers with plants 16” apart within rows. Treatments were arranged in a randomized complete block experimental design and consisted of four replicates. Twelve-foot alleyways separated all plots. Plots were treated with 2 pints of Treflan (trifluralin) on June 17 and immediately incorporated.

Mechanical and hand weeding were also done as needed during the season. Treatments consisted of the following materials:

Registered: Asana XL 0.66EC (0.04 lb. AI/A), Capture 2EC (0.033 and 0.04 lb AI/A), Warrior 1CS (0.02 and 0.025 lb AI/A), Mustang 1.5EW (0.05 lb AI/A), Spintor 2SC (0.046 lb AI/A), Intrepid 2SC (0.125 lb AI/A), Proclaim 5WG (0.0075 lb AI/A), and Avaunt 30WG (0.045 and 0.065 lb AI/A).

Other chemicals: FO 570 0.8EW (0.017 and 0.025 lb AI/A), GF 317 59.7CS (3.2 fl oz/A), and Novaluron 0.83 EC (0.039, 0.058, 0.078 and 0.0973 lb AI/A).

All materials were applied using a tractor mounted boom sprayer operating at 40 psi while delivering 20 gpa through five TeeJet XR8002 flat fan nozzles spaced at 18". All materials were tank mixed with Freeway at the rate of 8-oz/100 gal. Insect counts were taken from 20 cabbage heads destructively sampled per treatment (5 per plot) on August 15. Pupae were assumed to have been larvae at the time of application and were included in the larval counts. Cabbage head marketability ratings were taken on September 3, this was due to an attempt to get cabbage looper data from the trial. The plots were monitored for cabbage looper larvae and were resprayed on August 19, 28 but larval numbers were small in the untreated plots due to high levels of parasitism, and rainfall and larval surveys were not taken.

Marketability ratings were based on a 1-5 scale, 1-no insect feeding damage, 2-slight to moderate insect feeding damage on the wrapper leaves, 3-moderate to heavy insect feeding damage to wrapper leaves, 4-slight insect feeding on head, 5-heavy insect feeding on head.

RESULTS

All three lepidopteran pests were found among the plots during sampling with imported cabbageworm larvae being the most commonly found. Eight days after the insecticide applications on August 7 there were 16.8 total imported cabbageworm larvae, 8.8 total cabbage looper larvae and 7.7 diamondback moth larvae found per head in the untreated plots.

Imported cabbageworm larvae were effectively controlled in all the treatments and large larval numbers were significantly smaller in all the treated plots (Table 1). A survey of small larvae indicates residual insecticide activity and several trends are apparent. All the insecticide treatments limited larval reinfestation in the plots and all treatments had significantly smaller larvae populations than the untreated plots.

Cabbage looper larvae were also effectively controlled by all the insecticide treatments and small and large larval numbers were significantly smaller than the larval populations in the untreated plots (Table 1). Most of the treatments were equally effective with Capture 2E at both rates being the most effective.

Diamondback moth larvae were also effectively controlled by all the insecticides tested (Table 1). Most treatments gave moderate control and only the Capture 2E treatment limited larval numbers to less than one larva per head.

Damage ratings among the treatments varied from a rating of 5.0 the untreated plots to 1.5 in the better treatments (Table 1). The marketability ratings typically reflected the effectiveness of the treatments and the worst rating of 2.5 was the result of heavy feeding on the wrapper leaves, which can be removed for fresh market

.

Table 1. Lepidopteran larvae counts on Blue Vantage cabbage treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate	Diamondback moth	Imported cabbage worm		Cabbage looper		Marketability rating
			Small	Large	Small	Large	
Capture 2 E	0.033	0.4 g	0.3 f	0.6 b	0.5 g	0.2 ef	1.5 d
Capture 2 E	0.04	0.7 fg	0.1 f	0.4 b	0.7 g	0.1 ef	1.5 d
Warrior 1 CS	0.02	1.9 de	0.4 ef	1.0 b	2.0 ef	0.3 def	1.5 d
Warrior 1 CS	0.025	1.4 ef	0.4 def	0.7 b	1.9 ef	0.2 ef	1.5 d
FO 570 0.8 EW	0.017	2.3 cde	0.6 def	1.1 b	4.2 bcd	0.5 b-f	1.9 c
FO 570 0.8 EW	0.025	1.6 ef	0.6 def	0.9 b	2.0 ef	0.5 b-f	1.5 d
Spintor 2 SC	0.046	2.0 de	1.2 c	1.0 b	3.3 b-e	0.5 b-f	1.9 c
Asana 0.66 EC	0.04	1.6 ef	0.7 c-f	0.9 b	3.1 cde	0.3 def	1.5 d
GF317 59.7 CS	3.2 fl oz/A	1.4 ef	0.5 def	0.9 b	2.0 ef	0.6 b-f	1.5 d
Intrepid 2 SC	0.125	4.6 b	0.8 cde	0.6 b	2.7 de	0.4 b-f	1.6 d
Proclaim 5 WG	0.0075	2.5 cde	2.3 b	1.1 b	4.1 bcd	0.5 b-f	2.5 b
Novaluron 0.83 EC	0.039	3.5 bc	1.3 c	1.2 b	5.0 b	0.9 bc	1.9 c
Novaluron 0.83 EC	0.058	2.0 de	0.9 cde	0.5 b	4.5 bc	1 bcd	2.0 c
Novaluron 0.83 EC	0.078	2.3 cde	1.0 cd	0.9 b	3.1 cde	0.8 bcd	1.9 c
Novaluron 0.83 EC	0.0973	2.5 cde	1.1 cd	0.4 b	3.1 cde	0.6 b-e	1.6 d
Avaunt 30 WG	0.045	2.7 cde	0.3 f	0.4 b	3.0 cde	0.1 f	1.6 d
Avaunt 30 WG	0.065	1.7 e	0.6 def	0.4 b	1.3 fg	0.4 c-f	1.5 d
Mustang 1.5 EC	0.05	2.8 cd	0.5 def	0.8 b	3.1 cde	0.9 b	1.5 d
Untreated	---	7.7 a	4.7 a	12.1 a	7.2 a	1.6 a	5.0 a

Means in a column followed by the same letter do not significantly differ (Least Significant Difference Test, P=0.05).
Application date August 8.

Section III. Insect Control on Other Crops.

A. European Corn Borer Control on Snap Bean with Foliar Insecticides. Arlington.

In 2002, an experiment was established at the Arlington Experimental Farm to evaluate efficacy of registered and experimental insecticides in the management of European corn borer (ECB) on snap bean.

Plots of Hystyle variety snap beans were planted on May 30 and consisted of two rows by 50', planted on 30" centers. Plots were separated by two untreated borders, 12' alleyways, replicated four times, and arranged in a randomized complete block experimental design. Treflan was applied preplant incorporated at 2.0 pt./A on June 17 for weed control. Plots were also hand weeded as necessary to maintain weed control. Sevin at the rate of one qt./A was applied on July 9 for potato leafhopper control. Kocide at the rate of one pound per acre was also applied on July 9 for disease control.

All materials were applied using a tractor mounted boom sprayer operating at 40 psi while delivering 20 gpa through five flat fan nozzles (TeeJet XR8002) spaced at 18".

The following insecticides were evaluated for ECB on snap bean: Capture 2EC (0.025, 0.033, and 0.040 lb. a.i./A), Warrior 1CS (0.020 and 0.025 lb. a.i./A), Orthene 97SP (0.75 and 1.0 lb. a.i./A), Spinosad 2SC (4.5 fl. oz./A), FO570 0.8EC (0.025 lb. a.i./A), and Mustang 1.5EC (0.05 lb. a.i./A).

An insecticide application was made on July 17 and was timed three days after the first ECB infestation while the second ECB infestation was timed 4 days after the insecticide application.

At the time of infestation, five consecutive plants in each plot were infested with wax paper strips each containing 8-10 blackhead stage ECB egg masses. Egg masses were placed on the plants during optimal environmental conditions to increase survival of newly emerging larvae.

Snap beans were harvested and evaluated on August 1 (21 days post application) and included the inspection of the pods and stems of the five

infested plants from each infestation, recording damage and presence of live larvae.

Results

The early artificial infestations in 2002 (July 14) at first pin pod were effective and at harvest, stem damage in the untreated plots averaged 10.8 per five plants with five live larvae (Table 1). Pod damage in the untreated plots was 8.8 pods from 62.8 or 14% with 4.9 live larvae.

The late artificial infestations on July 21 were also effective and at harvest, plant damage in the untreated plots averaged four of the five plants and stem damage averaged eight per five plants with 4.3 live larvae (Table 2).

Plant and stem damage from the early-infested ECB larvae were similar among all the treatments indicating that the larvae emerged and fed on the plants and stems before the insecticides were applied. Differences between the untreated and treated plots in the late infestation are more defined. There are significant differences among the untreated and many of the treatments in plant, stem, and pod damage while larval numbers were typically higher in the untreated plots. Capture, Warrior, FO570, and Orthene at 1 lb. a.i./A provided significant reductions in plant, stem, and pod damage in comparison to the untreated plots. Larval numbers in the stems and pods were also significantly lower in the Capture, Warrior, FO570, and high rate Orthene treatments.

Table 1. European corn borer damage and larvae from Hystyle variety snap beans infested on July 14 and treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate (lb. a.i./A)	Total damaged		Pods		Larvae/Pod		Larvae/Stem	
		Plants	Stems	Total	Infested	Small	Large	Small	Large
Capture 2E	0.025	3.0 ab	4.0 c	43.3 ab	2.8 b	0.3 b	0.3 cd	0.3 b	1.3 ab
Capture 2E	0.033	2.0 b	2.3 c	43.5 ab	4.0 ab	0.0 b	0.8 bcd	0.3 b	1.0 b
Capture 2E	0.040	2.5 ab	4.3 bc	52.0 ab	4.0 ab	0.5 ab	0.5 cd	0.0 b	1.5 ab
Warrior 1CS	0.020	3.5 a	6.0 abc	55.8 ab	8.8 a	0.5 ab	2.3 ab	0.8 ab	2.8 a
Warrior 1CS	0.025	3.0 ab	5.8 abc	44.5 ab	6.5 ab	0.3 b	1.8 abc	0.8 ab	1.0 b
Orthene 97SP	0.750	3.0 ab	5.0 bc	60.5 a	5.5 ab	0.3 b	0.0 d	0.8 ab	1.0 b
Orthene 97SP	1.000	2.3 ab	2.8 c	42.5 ab	3.0 b	0.0 b	0.0 d	0.5 b	1.0 b
Spintor 2SC	0.070	3.0 ab	6.0 abc	55.3 ab	5.3 ab	0.0 b	1.5 a-d	0.3 b	1.0 b
FO570 0.8EW	0.025	2.8 ab	4.3 bc	61.3 a	3.3 b	0.3 b	1.0 a-d	0.8 ab	1.8 ab
Mustang 1.5EC	0.050	3.3 ab	9.8 ab	37 b	6.3 ab	0.5 ab	2.5 a	0.3 b	2.5 ab
Untreated	---	3.5 a	10.8 a	62.8 a	8.8 a	1.3 a	2.3 ab	2.5 a	2.3 ab

Means in a column followed by the same letter do not significantly differ (Least Significant Difference Test, P=0.05).

Table 2. European corn borer damage and larvae from Hystyle variety snap beans infested on July 21 and treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate (lb. a.i./A)	Total damaged		Pods		Larvae/Pod		Larvae/Stem	
		Plants	Stems	Total	Infested	Small	Large	Small	Large
Capture 2E	0.025	1.8 cd	2.8 cd	49.8 ab	3.5 bc	0.0 b	0.0 a	0.5 cd	0.0 b
Capture 2E	0.033	0.8 de	1.0 de	44.0 ab	0.8 c	0.0 b	0.0 a	0.3 d	0.0 b
Capture 2E	0.040	0.5 e	0.5 de	44.0 ab	1.8 bc	0.0 b	0.0 a	0.0 d	0.3 a
Warrior 1CS	0.020	0.3 e	0.3 e	55.8 a	1.0 c	0.0 b	0.0 a	0.0 d	0.0 b
Warrior 1CS	0.025	0.5 e	0.3 e	36.3 b	0.5 c	0.3 b	0.0 a	0.3 d	0.0 b
Orthene 97SP	0.750	3.0 ab	5.3 b	46.5 ab	5.8 b	1.5 b	0.0 a	2.5 abc	0.0 b
Orthene 97SP	1.000	2.5 bc	2.8 cd	51.8 ab	3.3 bc	0.5 b	0.0 a	2.0 bcd	0.0 b
Spintor 2SC	0.070	3.3 ab	4.0 bc	54.3 ab	12.3 a	4.0 a	0.0 a	2.8 ab	0.0 b
FO570 0.8EW	0.025	1.0 de	1.0 de	47.8 ab	1.3 c	0.0 b	0.0 a	0.3 d	0.0 b
Mustang 1.5EC	0.050	2.5 bc	3.8 bc	56.0 a	5.8 b	0.8 b	0.0 a	1.5 bcd	0.0 b
Untreated	---	4.0 a	8.0 a	55.0 a	11.8 a	4.3 a	0.0 a	4.3 a	0.0 b

Means in a column followed by the same letter do not significantly differ (Least Significant Difference Test, P=0.05).

Section III. Insect Control on Other Crops.

B. Insect Control on Bell Peppers with Foliar Insecticides. Arlington.

In 2002, an experiment was established at the Arlington Experimental Farm to evaluate efficacy of registered and experimental insecticides in the management of insect pests of bell pepper.

Plots consisting of California Wonder variety peppers were transplanted 18" apart in a single 20' row on June 8. Plots were separated by 9' borders, 12' alleyways, replicated four times, and arranged in a randomized complete block experimental design. Treflan was applied preplant incorporated at 1.5 pt./A on May 28 for weed control. Plots were also hand weeded as necessary to maintain weed control. Sevin at the rate of 1 qt./A was applied on July 11 for tarnished plant bug control and to reduce beneficial arthropod numbers in the plots.

One foliar application was made on August 13. All materials were applied with a CO_2 backpack sprayer with a 3-foot boom equipped with two TXVS 10, hollow cone nozzles delivering 25 gpa while operating at 38 psi.

Two registered and nine unregistered insecticides were evaluated for European corn borer (ECB) and aphid control on bell pepper.

Registered: Orthene 97SP (1.0 lb. a.i./A) and Asana XL 0.66EC (0.05 lb. a.i./A).

Experimental: F 1785 50DF (0.018, 0.036, and 0.071 lb. a.i./A), Assail 70WP (0.05 lb. a.i./A), FO570 0.8EC (0.018 and 0.025 lb. a.i./A), Mustang 1.5EC (0.05 lb. a.i./A), Warrior 1CS (0.03 lb. a.i./A), and Baythroid 2E (0.044 lb. a.i./A).

On August 16, 3 days post insecticide application; peppers were infested with European corn borer by pinning wax paper strips containing approximately 10 egg masses in the black head stage into the plant canopy.

Pepper fruit was harvested from the plots on September 5 (21 days post application) and ECB larvae and fruit damage was evaluated.

Aphid populations were evaluated 6 days after application (August 19) by removing 10 leaves per plot and counting the aphids present. Several aphid species were present and these were counted as green peach aphid and other

aphid species as a complex. Aphid numbers crashed in the plots following the insect survey on August 19 and no further aphid counts were taken.

Results

Green peach aphid numbers were low on August 19 while “other” aphid numbers were slightly higher (Table 1). Green peach aphid numbers ranged from 19.3 per 10 leaves in the Mustang Max plots to 0 aphids in the F1785, Orthene and Asana treatments. “Other” aphid numbers were highest in the untreated plots (23.5 aphids/10 leaves) and lowest in the Orthene and Asana treatments. Since aphid numbers were so low it is difficult to draw any conclusions from the data.

Table 1. Aphids from California wonder variety peppers treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate (lb. a.i./A)	Mean aphids per 10 leaves	
		GPA	Others
F 1785 50DF	0.018	1.3 de	2.0 de
F 1785 50DF	0.036	0.0 e	5.0 cde
F 1785 50DF	0.071	0.5 e	1.5 e
Assail 70WP	0.05	0.3 e	2.0 e
FO570 0.8EC	0.018	3.8 bcd	5.8 bcd
FO570 0.8EC	0.025	5.3 bc	7.8 bc
Mustang 1.5EC	0.05	19.3 a	10.0 bc
Warrior 1CS	0.03	2.0 cde	2.3 de
Baythroid 2E	0.044	5.3 bc	12.0 b
Orthene 97SP	1.0	0.0 e	1.3 e
Asana 0.66EC	0.05	0.0 e	1.3 e
Untreated	---	7.8 b	23.5 a

Means in a column followed by the same letter do not significantly differ (Least Significant Difference Test, P=0.05).
Application date August 13.

Table 2. European corn borer damage and larval counts from California Wonder variety peppers treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate (lb. a.i./A)	Fruit			Total number of large larvae
		Total	# Infested	# Infested with large larvae	
Assail 70WP	0.05	35.5 a	31.0 a	9.8 a	11.8 a
FO570 0.8EC	0.018	38.0 a	12.0 c	4.8 b	4.8 bc
FO570 0.8EC	0.025	38.5 a	8.5 cd	1.8 bc	1.8 bc
Mustang 1.5EC	0.05	34.0 a	9.3 cd	2.0 bc	2.0 bc
Warrior 1CS	0.03	43.8 a	5.0 d	0.5 c	0.5 c
Baythroid 2E	0.044	33.5 a	13 c	3.8 bc	3.8 bc
Orthene 97SP	1.0	35.0 a	5.5 d	1.5 bc	1.5 bc
Asana 0.66EC	0.05	31.0 a	19.0 b	5.3 b	5.0 b
Untreated	---	33.5 a	26.8 a	13.8 a	14.8 a

Means in a column followed by the same letter do not significantly differ (Least Significant Difference Test, P=0.05).

Section III. Insect Control on Other Crops.

C. Onion Thrip Control on Onion with Foliar Insecticides. Arlington.

In 2002, an experiment was established at Kincaid Farms, Palmyra Wisconsin to evaluate efficacy of registered and experimental insecticides in the management of onion thrip on onion. The site was chosen due to the history of onion production on the muck soil and the grower informed us of an onion thrip control problem on his farm.

Onion plots were established on August 7 and they consisted of 6 x 20 foot onion beds (6 rows), replicated four times in a randomized complete block experimental design. The onion plots were established in a commercial onion field managed with commercial onion production practices.

One foliar application was made on August 14. All materials were applied with a CO_2 backpack sprayer with a 6-foot boom equipped with two TXVS 10, hollow cone nozzles delivering 26.7 gpa while operating at 38 psi.

The following insecticides were evaluated for thrip control on onion: Warrior 1 CS (0.010, 0.020, 0.030, and 0.060 lb ai/A), Warrior-red dot 1 CS (0.010, 0.020, 0.030, and 0.060 lb ai/A), FO 570 0.8 EW (0.025 lb ai/A), Assail 70WP (0.050 lb ai/A), Actara 25 WG (0.15 oz/A), Lannate 1.8 SL (0.9 lb ai/A), Capture 2 EC (0.040 lb ai/A), F1785 50 DF (0.053 lb ai/A). Freeway was added to all the treatments at the rate of 0.25% v/v.

Thrip surveys were taken on August 16 (2 days post application) and August 21 (7 days post application). Thrip surveys consisted of counting the total number of living thrips on ten randomly selected plants from each plot.

Results

Thrip numbers were at high levels in the plots during July and August and this was due to the abnormally hot and dry weather conditions being experienced in Southern Wisconsin during July and August 2002. Thrip numbers peaked in the untreated plots at 30.7 thrips per plant on August 16 and declined slightly to 27.6 thrips per plant on August 21 before the onion plants died the following week.

Upon examining the data, it is apparent that onion thrips are difficult to control and two days after application, only three insecticide treatments had significantly reduced thrip numbers (Table 1). Warrior red dot at 0.03 lb. a.i./A, Actara 25WG at 0.15 oz./A, and Lannate 1.8SL at 0.9 lb. a.i./A effectively reduced thrip numbers after application. However, at 7 days post application only the Actara and Lannate treatments continued to suppress thrip numbers while many of the other treatments had numbers equal to or higher than numbers in the untreated plots.

Table 1. Onion thrips sampled from onions treated with foliar insecticides. Kincaid Farms, Palmyra, WI 2002.

Treatment	Rate (lb. a.i./A)	Mean thrips per plant	
		8-16	8-21
Warrior 1CS	0.010	26.8 ab	38.4 ab
Warrior 1CS	0.020	23.2 ab	33.4 abc
Warrior 1CS	0.030	24.9 ab	29.3 bc
Warrior 1CS	0.060	22.7 ab	31.1 abc
Warrior 1CS/red dot	0.010	25.9 ab	34.1 abc
Warrior 1CS/red dot	0.020	23.0 ab	30.3 abc
Warrior 1CS/red dot	0.030	16.8 bc	29.5 bc
Warrior 1CS/red dot	0.060	28.3 ab	40.8 a
FO570 0.8EW	0.025	20.7 ab	36.0 abc
Assail 70WP	0.050	22.1 ab	26.0 c
Actara 25WG	0.15 oz/A	16.1 bc	16.8 d
Lannate 1.8SL	0.9	8.9 c	15.6 d
Capture 2EC	0.040	26.1 ab	36.9 abc
F1785 50DF	0.053	23.2 ab	27.9 bc
Untreated		30.7 a	27.6 c

Means in a column followed by the same letter do not significantly differ (Least Significant Difference Test, P=0.05).

Section III. Insect Control on Other Crops.

D. Soybean Aphid Control on Snap Beans with Foliar Insecticides. Arlington.

In 2002, an experiment was established at the Entomology Research Farm, Arlington Wisconsin to evaluate efficacy of registered and experimental insecticides in the management of soybean aphid on snap bean.

Hystyle variety snap beans were planted on July 24. Plots consisted of four twenty-foot rows on 30-inch centers, replicated four times in a randomized complete block experimental design. Treflan was applied at 2 qt./A and preplant incorporated on June 17.

One foliar application was made on August 2. All materials were applied with a CO_2 backpack sprayer with a 6-foot boom equipped with two TXVS 10, hollow cone nozzles delivering 25 gpa while operating at 38 psi.

The following insecticides were evaluated for soybean aphid control on snap beans: Orthene 97SP (0.50, 0.75, and 1.0 lb. a.i./A), Capture 2 EC (0.02, 0.04, and 0.063 lb. a.i./A), Warrior 1 CS (0.025 lb ai/A), F1785 50 DF (0.053, 0.071, and 0.088 lb ai/A), and Dimethoate 4E (0.50 lb. a.i./A).

Soybean aphid surveys were taken on August 5 (3 days post application) and August 9 (7 days post application). Aphid surveys consisted of counting the total number of winged and non-winged aphids on ten randomly selected leaves from each plot. Soybean aphid numbers crashed after the second insect survey on August 9 and no further surveys were taken. Plots were harvested on September 28.

Results

Soybean aphid numbers were at high levels on the newly emerged snap beans during the precount on August 2, winged aphid numbers averaged 5.4 per leaf and non winged aphid numbers averaged 15.7 per leaf. Aphid numbers peaked in the untreated plots on August 9 at 4.8 winged and 22.3 non-winged aphids per leaf (Table 1). Aphid numbers were reduced by all the treatments but numbers in the Orthene 97SP (0.50) and F1785 50DF (all rates) treatments were

not significantly lower than the untreated plots on August 5. On August 9 aphid numbers increased throughout the study but non-winged aphid numbers were at significantly lower levels in the treated plots than in the untreated plots. Winged aphid numbers on August 9 were lowest in the Orthene 97SP (all rates), Capture 2EC (0.02 and 0.063), and Dimethoate 4E treatments.

In general, seven days after application (August 9) Dimethoate 4E, Capture 2EC, and Orthene 97SP reduced winged aphid infestation the best while the high rate of Capture 2EC provided the best control of non-winged aphids (Table 1).

Table 1. Soybean aphid sampled from snap beans treated with foliar insecticides. Arlington, WI 2002.

Treatment	Rate (lb. a.i./A)	Mean aphids per 10 leaves			
		8-5		8-9	
		Winged	Non winged	Winged	Non winged
Orthene 97SP	0.50	29.8 ab	80.5 abc	19.3 d	108.3 bcd
Orthene 97SP	0.75	19.0 bcd	62.0 bcd	24.8 cd	93.5 cde
Orthene 97SP	1.0	17.8 cd	53.0 c-f	22.3 cd	84.3 de
Capture 2EC	0.02	14.3 d	48 def	27.3 bcd	95.5 b-e
Capture 2EC	0.04	17.5 cd	33.3 f	33.0 abc	91.3 cde
Capture 2EC	0.063	16.5 d	37.8 ef	32.0 bcd	72.3 e
Warrior 1CS	0.025	20.3 bcd	33.3 f	32.0 a-d	100.0 b-e
F1785 50DF	0.053	27.8 abc	87.3 ab	42.5 ab	127.8 b
F1785 50DF	0.071	24.8 a-d	76.8 abc	42.0 ab	123.3 bc
F1785 50DF	0.088	21.8 a-d	70.3 a-d	34.5 abc	98.8 b-e
Dimethoate 4E	0.50	18.5 bcd	61.0 b-e	25.5 cd	111.3 bcd
Untreated	---	32.8 a	101.0 a	47.8 a	223.0 a

Means in a column followed by the same letter do not significantly differ (Least Significant Difference Test, P=0.05).