

USING ADMIRE AND TEMIK TO CONTROL APHIDS ON RUSSET BURBANK POTATOES

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Abstract

A field experiment to evaluate long-term aphid control on potatoes was planted at the Madras site of Central Oregon Agricultural Research Center in 1995. Treatments included Admire at 18.9, 16.0, and 13.1 ounces of product per acre, Temik at 20 pounds of product per acre, and an untreated check. Aphids were collected weekly by beating cloth and green tile traps from 41 days after planting to 110 days after planting. In beating cloth samples, the high rate of Admire (18.9 oz/a) controlled wingless aphids for 103 days, the low rate of Admire (13.1 oz/a) for 97 days, and Temik controlled aphids for 71 days after application. There were fewer winged aphids collected by beating cloths from plots treated with Temik than either the Admire or check treatments. The number of aphids collected from green tile traps were variable and not correlated with beating cloth samples.

Introduction

Insect control in potatoes has been challenging since the market withdrawal of Temik (aldicarb) in 1989. Growers have relied on systemic insecticides that are effective for short periods of time early in the growing season, and multiple applications of a foliarly-applied organophosphate for the remainder of the growing season. That practice was expensive, killed beneficial insects, promoted insect resistance to the organophosphates, and did not provide effective control against Potato Virus Y (PVY).

PVY is spread in a non-persistent manner by the green peach aphid, and perhaps more importantly, by various grain aphids (2). Attempts to control the spread of PVY in potato fields with foliarly-applied aphicides have been limited because the aphicides are effective for short periods of time. In a typical 14 day spray schedule, aphids are controlled for less than 48 hours before the insecticide breaks down. Transient aphids are then free to enter the field, probe, and spread PVY until the next insecticide application is made.

Systemic insecticides, including Admire and Temik, have several inherent advantages over foliarly-applied products. Systemics target sucking and chewing insects, provide effective insect control in all plant tissues for extended periods of time, and are generally safe to apply. Foliarly-applied insecticides, on the other hand, kill both harmful and beneficial insects. They are generally effective for only short periods of time, and do not provide control on plant growth that has developed since the last application. An effective integrated approach to insect control includes careful monitoring of insect populations, the application of systemic insecticides, and use of foliarly-applied materials only when necessary.

Admire 2F (imidacloprid) gained an EPA registration for use on potatoes November 18, 1994. Bayer Corporation, the developer and marketer of Admire, claimed the new long-lived systemic insecticide would control Colorado potato beetle, green peach aphid, leafhoppers, and potato flea beetle. Research conducted during 1994 in the Columbia Basin at Hermiston, Oregon demonstrated that Admire applied at planting at 20 oz/acre effectively controlled aphids and Colorado potato beetle for much of the growing season. Similar results were noted for prior years (3).

This experiment was designed to compare the efficacy of Admire on aphids at the highest labeled rate, a mid rate, and the lowest labeled rate in a short growing season location (120 days). Temik was also included in the experiment because of the anticipated reregistration of the product.

Materials and Methods

An experiment to evaluate long-term aphid control on potatoes was planted June 1, 1995 at the Madras site of Central Oregon Agricultural Research Center. Plots measured 36 feet (12 rows) by 50 feet and were arranged in a latin square experimental design with five replications and five treatments. Plots within each column were separated by a six foot unplanted border and plots within each row were separated by a four foot unplanted border. The experiment was planted with certified Russet Burbank seed and fertilized with 920 lb/a of 19-15-15-6 (NPKS) banded to the side and slightly below the seed pieces at planting. The trial area was sprinkler irrigated and managed with cultural practices common in central Oregon.

The three Admire treatments were applied at planting by dribbling the insecticide solution into the furrow behind the planter seed piece drop chute using application equipment manufactured by Custom Ag Products, Benson, MN. The Admire solution and seed pieces were covered with soil after placement in the furrow. Admire treatments included 18.9, 16.0, and 13.1 ounces of Admire per acre and rate variables were achieved by varying the planter ground speed based on prior calibrations.

The application equipment was turned off when planting check treatments. The Temik treatment was banded 3 inches to the side and below the 2 to 4 inch high plants on July 3, 1995 prior to hilling.

Aphids were collected by two methods, beating cloth (27 x 27 inches) and pan traps. Beating cloth samples were obtained by beating plants from five hills from the center six rows of each plot and collecting all aphids on the cloth. Sampling rows and sites were rotated, allowing no area to be sampled more than once in six weeks. The pan traps were made with 2,000 ml clear styrene-acrylonitrile boxes (VWR# 36212-361) with a tile painted to match the color of the foliage placed in the bottom of the box. The boxes were filled with water to within 1 inch of the top. The tile traps were mounted on adjustable rods and adjusted near the top of the foliage each week throughout the growing season.

Aphids collected from the beating cloth and tile traps were identified as wingless, green peach aphids (GPA), or aphids other than GPA. Plots were sampled weekly from July 12 to September 20, 1995.

Results and Discussion

The number of aphids caught throughout the collection period is summarized in Tables 15. Aphid collection commenced on July 12, 1995 when plants were about 10 inches high (41 days after Admire application). Aphid numbers were relatively low for much of the growing season, but a few wingless and winged aphids were collected the first three weeks then, during mid-summer, aphids numbers dropped to near zero. Aphid numbers continued to increase from mid-summer until plants were killed in late September.

Wingless aphids colonize on the plants and may be the best indicator of systemic insecticide efficacy. Wingless aphids were noted weekly in the untreated check treatments, with higher populations early and late in the growing season (Table 1). The first wingless aphids appeared in beating cloth samples from Admire-treated plots 83 days after application. No wingless aphids were noted at the high rate of Admire (18.9 oz/a) until 103 days. Wingless aphids were collected from all treatments 103 days after treatment with Admire. Significant numbers of wingless aphids appeared in plots treated with Temik 70-80 days after the Temik was applied (Temik was applied 32 days later than Admire). The data suggest that Admire controls wingless aphids for about 30 days longer than Temik.

Winged GPA and all other aphids collected from beating cloth samples are summarized in Tables 2 and 3. No GPA were collected during the middle part of the growing season, but a few were noted early and greater numbers were collected late in the growing season.

The greatest number of aphids other than GPA were collected during the first part of the collection period and were likely grain aphids leaving nearby maturing wheat fields.

Fewer winged aphids were observed in beating cloth samples from plots treated with Admire and Temik than check plots during the early part of the collection period. Later in the season, the number of winged aphids collected from the Admire treatments did not differ significantly from the untreated check. Fewer winged aphids were observed on plots treated with Temik than the plots treated with Admire during the early and late parts of the collection period. It is possible that this observation is due to a difference between Temik and Admire in the time required to kill the aphids. Apparently, Temik kills aphids relatively rapidly after probing a treated leaf. Admire, on the other hand, is perhaps slower in killing aphids after probing. Press releases by Miles, Inc., indicated that aphids may continue to live for 96 hours after ingesting the insecticide. The aphids are rendered inactive immediately, but remain on the plants for a longer period of time and thus would be collected in beating cloth samples (1).

Green tile traps were placed in each plot to monitor general winged aphid flight activity and to compare the number of aphids trapped with beating cloth samples. Green tiles that

approximated the color of the potato canopy were used to sample aphids that would normally be attracted to healthy potato foliage.

Aphids collected from green tile traps are summarized in Tables 4 and 5. There were no statistically significant differences among the treatments for the number of GPA caught in green tile traps except at 103 days after the Admire application. Statistically significant differences for aphids other than GPA were observed among the treatments at 62, 76, 97, and 103 days after the Admire application. No clear trend in aphid numbers among the treatments was apparent at those observation dates.

The total number of aphids collected for each plot from beating cloth samples and green tile traps were compared. There was no correlation ($r=0.0575$, $n=25$) between the two methods of collection.

A summary for the entire growing season for each collection method and type of aphid is presented in Table 6. All insecticide treatments provided good control of wingless aphids when compared to the untreated check. Fewer winged aphids were collected from plots treated with Temik than Admire-treated plots or the untreated check. There were no differences among all treatments when the aphids were sampled with green tile traps placed in the plant canopy of each plot.

Table 1. Number of wingless aphids collected from beating cloth samples during the growing season, Madras, OR, 1995.

Treatment	41	48	Days After Application of Admire							97	103	110
			55	62	69	76	83	90				
	Number of Aphids											
Admire (High)	0	0	0	0	0	0	0	0	0	0	0.4	1.8
Admire (Med)	0	0	0	0	0	0	0.2	0	0	0	0.6	2.8
Admire (Low)	0	0	0	0	0	0	0	0	0.4	1.8	5.2	
Temik*	0	0	0	0	0	0.2	0	0	0	0	0.8	11.8
Check	6.4	5.0	3.8	2.2	1.0	0.2	6.2	8.0	8.4	26.0	84.8	
LSD--5%	2.0	1.8	1.9	20	NS	NS	3.0	2.1	2.9	7.4	18.8	

*Temik was banded 32 days after the Admire application.

Table 2. Number of winged GPA collected from beating cloth samples during the growing season, Madras, OR, 1995.

Treatment	41	48	55	Days After Application of Admire					97	103	110
				62	69	76	83	90			
Number of Aphids											
Admire (High)	0.6	4.8	0	0	0	0	0.6	0.6	3.2	3.0	10.2
Admire (Med)	0.4	3.0	0.2	0.2	0	0	0.2	0.4	2.0	3.0	6.4
Admire (Low)	0.4	4.6	0.2	0	0	0	0	0.4	1.2	2.4	9.0
Temik*	0	1.0	0	0	0	0	0.2	0	0.2	0.6	2.4
Check	2.6	7.8	0.6	0.4	0	0	0.2	0.4	3.2	2.6	9.6
LSD--5%	1.4	3.7	0.4	NS	NS	NS	NS	NS	2.4	NS	4.9

*Temik was banded 32 days after the Admire application.

Table 3. Number of winged aphids (excluding GPA) collected from beating cloth samples during the growing season, Madras, OR, 1995.

Treatment	41	48	55	Days After Application of Admire					97	103	110
				62	69	76	83	90			
Number of Aphids											
Admire (High)	0.4	1.8	0	0	0	0	0	0	0	0	0.6
Admire (Med)	0.6	1.4	0.2	0.2	0	0	0.2	0	0	0.2	0.2
Admire (Low)	0.6	2.2	0.4	0	0	0.2	0	0.2	0.8	0	0.2
Temik*	0.4	0.8	0	0	0	0	0	0	0.2	0	0
Check	1.6	4.4	1.6	0.2	0	0	0.2	0.2	0	0	0.2
LSD--5%	1.1	2.3	1.0	NS	NS	NS	NS	NS	NS	NS	NS

*Temik was banded 32 days after the Admire application.

Table 4. Number of winged GPA collected from green tile traps during the growing season, Madras, OR, 1995.

Treatment	41	48	55	Days After Application of Admire					97	103	110
				62	69	76	83	90			
	Number of Aphids										
Admire (High)		0.6	0	0	0	0	0	0	0.6	0.2	0.6
Admire (Med)		0.6	0	0	0	0	0	0.2	0	1.4	0.2
Admire (Low)		0.6	0	0.2	0	0	0	0	0.2	0.4	1.4
Temik*		0.2	0	0	0	0	0	0.2	0	0	0.2
Check		0.2	0.2	0	0	0	0	0	0.8	0.2	1.2
LSD--5%	--	NS	NS	NS	NS	NS	NS	NS	NS	0.9	NS

*Temik was banded 32 days after the Admire application.'

Table 5. Number of winged aphids (excluding GPA) collected from green tile traps during the growing season, Madras, OR, 1995.

Treatment	41	48	55	Days After Application of Admire					97	103	110
				62	69	76	83	90			
	Number of Aphids										
Admire (High)		2.8	1.6	4.2	3.6	1.0	3.8	1.4	4.6	1.8	1.4
Admire (Med)		3.2	1.6	4.0	1.6	0.8	4.6	2.8	3.2	2.6	2.4
Admire (Low)		1.8	0.8	4.0	3.2	1.2	3.6	2.0	5.4	3.0	1.6
Temik*		3.6	2.8	5.0	3.6	0.2	4.2	1.4	3.6	1.2	1.4
Check		3.4	2.4	1.4	2.4	0.9	NS	NS	2.6	3.2	1.4
LSD--5%		NS	NS	2.7	NS					1.7	NS

*Temik was banded 32 days after the Admire application.

Table 6. Summary of all aphids collected from Russet Burbank potatoes by beating cloth and green tile traps throughout the growing season at Madras, OR, 1995.

Treatment	Rate	Beating Cloth			Green Tile Trap	
		Wingless	Winged		Winged	
		All	GPA	Other	GPA	Other
Number of Aphids						
Admire	18.9 oz/a	2.2	23.0	2.8	2.0	26.2
Admire	16.0 oz/a	3.6	15.8	3.0	2.4	26.8
Admire	13.1 oz/a	7.4	18.2	4.6	2.6	26.6
Temik	20.0 lb/a	12.8	4.4	1.4	0.8	27.0
Check		152.0	27.4	8.4	2.6	24.4
LSD--5%		24.8	9.3	2.6	NS	NS

References

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2. Ragsdale, D., T. Radcliffe, and C. DiFonzo. 1994. Crop Borders--A Way to Prevent Spread of PVY. Valley Potato Grower. July 1994.

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