Onion thrips control on cabbage in Ohio, 2013

Final report 12/31/2013

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Introduction: The onion thrips has been causing increasing problems with processing and fresh market cabbage in northern Ohio for the past few years. Growers have expressed strong interest in adopting an aggressive program of insecticide control using registered products, and interest in the potential for using experimental products such as Exirel (cyazypyr) as registrations develop.

Methods:

The cabbage variety 'Score' (Bejo Seeds Inc.), a popular processing variety that is thrips susceptible, was seeded in 200-cell plug trays on 4 April. Plots were established by transplanting on 8 May at the North Central Agricultural Research Station (NCARS) of the Ohio Agricultural Research and Development Center (OARDC) in Sandusky County near Fremont, Ohio. Each plot was one twin-row bed, 25 feet long. Twin rows were 18 inches apart; within-row plant spacing was 18 inches. There were six treatments, each with four replicates in a randomized complete block design. Each treatment bed was flanked by an untreated guard bed. Blocks were separated by 20-foot alleys.

The standard thrips control program was defined as eight spray applications in a sequence of four products: Movento (spirotetramat), Radiant (spinetoram), Assail (acetamiprid), and Lannate (methomyl), each with two consecutive applications. All insecticides used for thrips control were assumed to have adequate activity for caterpillar control, with the exception of Movento; Dipel (*Bacillus thuringiensis*) was used with Movento to control caterpillars.

Insecticides were sprayed every 10 days starting on 21 May, two weeks after transplanting. The insecticide programs and spray dates are summarized in Table 1. Rates of insecticides and adjuvants used were Exirel 10SE (cyazypyr), 16.9 fl oz/A, plus COC 0.5%; Lannate LV 2.4WSL, 48 fl oz/A, plus COC 0.5%; Radiant 1SC, 8 fl oz/A, plus LI-700 0.25%; Assail 30SG, 4 oz/A, plus LI-700 0.25%; Movento 2SC, 5 fl oz/A, plus DyneAmic 0.25%, plus Dipel DF, 1 lb/A. The crop was not mature enough to harvest after the eighth spray, so a ninth spray was applied to all plots except the untreated check, using Baythroid XL (cyfluthrin) at 0.8 fl oz/A. Insecticides were applied by an R&D Plot Sprayer that had a CO_2 regulator, and boom with TwinJet nozzle tips spaced 15 inches apart that delivered 45.9 gallons per acre. The exception was the fifth spray that was applied by CO_2 backpack sprayer at 48 gal/A due to wet soil conditions. Two additional insecticide treatments were made to the entire field for flea beetle control: on 21 May, Sevin XLR Plus, 32 fl oz/A was applied by a ground sprayer, and on 10 July, Sevin was applied again by airplane.

Table 1. Schedule of insecticide sprays in cabbage trial, 2013, at Fremont, Ohio.

Treatment	Sprays 1 & 2, 21 May & 31 May	Sprays 3 & 4, 11 & 20 June	Sprays 5 & 6, 1 & 9 July	Sprays 7 & 8, 19 & 29 July	Spray 9, 9 August
1 (standard)	Movento + Dipel	Radiant	Assail	Lannate	Baythroid
2	Movento + Dipel	Exirel	Assail	Lannate	Baythroid
3	Movento + Dipel	Radiant	Exirel	Lannate	Baythroid
4	Movento + Dipel	Radiant	Assail	Exirel	Baythroid
5	Radiant	Exirel	Assail	Lannate	Baythroid
6 (untreated)	-	-	-	-	

Treatments were evaluated for thrips damage at harvest on 15 August by rating a sample of five randomly selected heads per plot. Heads were weighed by processing standards, with wrapper leaves removed. Each head was cut in half, and 10 layers of leaf were then peeled back and examined individually for thrips injury. Thrips injury was rated on scale of 0 (no injury) to 5 (severe injury). Head weight and damage rating data were subjected to analysis of variance (ANOVA) and mean comparisons by least significant difference (LSD) tests in the SAS 9.3 microcomputer statistics program.

Caterpillar damage was rated on 6 and 15 August, on 3 plants per plot, using the Greene rating scale.

Fungicides applied to all plots were: on 7 June, Bravo Weatherstik, 1.5 pt/A; on 12 and 20 June, Bravo, 1.5 pt/A, and Kocide, 0.5 lb/A; on 24 June, Manzate Prostick, 2 lb/A; on 15 July, Quadris, 8 oz/A, and Presidio, 3 oz/A, and Kocide 2000, 1.5 lb/A; on 26 July, Bravo, 1.5 pt/A; and on 31 July, Manzate Prostick, 1.75 lb/A.

Results and discussion:

There was significantly more injury by thrips in untreated plots than in the four insecticide treatments, as measured by the thrips total injury rating, which is the sum of individual ratings on each of the ten outermost head leaves ($P < 0.0001$; Table 2). Among the four insecticide programs, thrips injury did not vary significantly, but was least in the Radiant/ Exirel/ Assail/ Lannate treatment and greatest in the standard treatment of Movento/ Radiant/ Assail/ Lannate. The deepest leaf layer with an injury rating greater than 1, which ignores the lightest damage, showed the same trend, with all insecticide treatments significantly better than untreated plots, but no significant difference among the four insecticide programs ($P = 0.0057$; Table 2). The other two injury variables showed similar trends but with some significant differences among the four insecticide programs. The number of leaves with any thrips injury was significantly less in the Radiant/ Exirel/ Assail/ Lannate treatment than in the standard Movento/ Radiant/ Assail/ Lannate treatment ($P < 0.0001$, Table 2), and likewise the deepest layer with any thrips injury was significantly less in the Radiant/ Exirel/ Assail/ Lannate treatment than in the standard Movento/ Radiant/ Assail/ Lannate treatment ($P = 0.0132$, Table 2). The weight per head did not show any significant treatment effect ($P = 0.16$, Table 2).

Caterpillar damage was effectively controlled by all insecticide programs, which all had damage rating significantly lower than the untreated control (Table 3).

Rainfall was frequent (Table 4); no supplemental irrigation was needed.

In conclusion, Exirel will be a welcome alternative to other products for control of thrips as well as caterpillar pests, once it becomes registered. Exirel performed best when positioned second in the sequence of four products and when preceded by Radiant rather than Movento. Although Radiant had been positioned second in the sequence because this typically occurs at the cabbage cupping stage, which is the most critical for thrips control, the results of this trial suggest that Radiant earlier in the program might be more effective.

Acknowledgements: Thanks to Matt Hofelich and his field crew for crop establishment and maintenance, to Frank Thayer for applying treatments, to Stan Gahn and Mark Koenig for technical advice, and to James Radl, Clint Fleshman, and Dana Martin for technical assistance with insect evaluations. Funding and products were supplied by E. I. du Pont de Nemours and Company and Dow AgroSciences LLC. We appreciate insecticide product donations from United Phosphorus, Inc., Valent U.S.A. Corporation, and Bayer CropScience.

Table 2. Thrips injury on cabbage heads and weight of cabbage heads at harvest on 15 August 2013 at Fremont, Ohio.

Treatment (sequence of products and number of sprays of each)	Thrips injury				Weight per head, kg
	Thrips total injury rating (sum of ratings on 10 leaves)[a]	Number of leaves with any injury[a]	Deepest layer with any injury[a]	Deepest layer with rating >1[a]	
Radiant(2)/ Exirel(2)/ Assail(2)/ Lannate(2)	1.2 B	0.8 C	1.2 C	0.6 B	2.78
Movento(2)/ Radiant(2)/ Assail(2)/ Exirel(2)	1.8 B	1.2 BC	1.6 BC	0.7 B	2.74
Movento(2)/ Exirel (2)/ Assail(2)/ Lannate(2)	2.3 B	1.2 BC	1.9 BC	1.2 B	3.09
Movento(2)/ Radiant(2)/ Exirel(2)/ Lannate(2)	2.4 B	1.3 BC	2.0 BC	1.0 B	2.46
Movento(2)/ Radiant(2)/ Assail(2)/ Lannate(2)	2.4 B	1.8 B	2.6 AB	1.0 B	2.59
Untreated	6.8 A	3.1 A	3.4 A	2.4 A	2.63
P value for treatment effect	*<0.0001*	*<0.0001*	*0.0132*	*0.0057*	*0.1572*

[a] Within each column, means followed by same letter are not significantly different (*P*>0.05); mean separations by LSD.

Table 3. Ratings for caterpillar feeding damage on cabbage plants on 6 August (9 days before harvest) and on 15 August 2013 (the day of harvest), at Fremont, Ohio.

Treatment (sequence of products and number of sprays of each)	Greene scale rating[a]	
	6 August [b]	15 August [b]
Radiant(2)/ Exirel(2)/ Assail(2)/ Lannate(2)	1.3 B	1.2 B
Movento+Dipel(2)/ Radiant(2)/ Assail(2)/ Exirel(2)	1.4 B	1.5 B
Movento+Dipel(2)/ Exirel (2)/ Assail(2)/ Lannate(2)	1.4 B	1.2 B
Movento+Dipel(2)/ Radiant(2)/ Exirel(2)/ Lannate(2)	1.4 B	1.2 B
Movento+Dipel(2)/ Radiant(2)/ Assail(2)/ Lannate(2)	1.1 B	1.2 B
Untreated	3.3 A	3.0 A
P value for treatment effect	*<0.0001*	*<0.0001*

[a] Greene's rating scale: 1 = marketable, no apparent insect feeding; 2 = marketable, minor insect feeding on wrapper or outer leaves, 0-1% leaf area eaten; 3 = marketable, moderate insect feeding on wrapper or outer leaves with no head damage, 2-5% leaf area eaten; 4 = unmarketable, moderate insect feeding on wrapper or outer leaves with minor feeding on head, 6-10% leaf area eaten, head unmarketable under normal market conditions; 5 = unmarketable, moderate to heavy feeding on wrapper and head leaves and a moderate number of feeding scars on head, 11-30% of leaf area eaten; 6 = unmarketable, considerable insect feeding on wrapper and head leaves with head having numerous feeding scars, over 30% of leaf area eaten. (Greene, G. L. et al. 1969. JEE 62: 798-800.)

[b] Within each column, means followed by same letter are not significantly different (*P*>0.05); mean separations by LSD.

Table 4. Rainfall at the North Central Agricultural Research Station (NCARS) of the Ohio Agricultural Research and Development Center (OARDC) in Sandusky County near Fremont, Ohio, 2013.

Date	Rainfall (inch)
6/25	0.50
6/27	1.85
6/28	0.40
6/29	0.40
7/1	2.70
7/4	0.40
7/5	0.80
7/8	0.70
7/9	0.80
7/10	1.60
7/11	0.25
7/19	0.25
7/20	3.50
7/22	0.85
7/27	0.65
8/12	0.65