Onion thrips control on cabbage in Ohio, 2015

Final report 12/31/2015

Celeste Welty, Associate Professor of Entomology, The Ohio State University
Rothenbuhler Laboratory, 2501 Carmack Rd., Columbus OH 43210-1065;
e-mail: welty.1@osu.edu; phone: 614-292-2803; fax: 614-292-9783

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, including how best to use the new insecticide Exirel (cyantraniliprole), which has been registered since 2014. This trial was done to compare a lower rate of Exirel with the previously used higher rate, and to evaluate the experimental compound cyclaniliprole. A trial in 2013 had determined that Exirel was most effective for thrips control when positioned as the second product in a seasonal program of four products.

Methods:

The cabbage variety 'Cheers' (American Takii, Inc.), a popular processing variety that is thrips susceptible, was seeded in 200-cell plug trays on 3 April. Plots were established by transplanting on 12 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 five 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: Radiant (spinetoram), Movento (spirotetramat), 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 tank mixed with Movento to control caterpillars.

Insecticides were sprayed every 10 days starting on 22 May, 10 days after transplanting. The insecticide programs and spray dates are summarized in Table 1. Rates of insecticides and adjuvants used were Exirel 10SE (cyazypyr), 13.5 and 16.9 fl oz/A, plus COC 0.5%; cyclaniliprole 50SL, 16.4 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 LI-700 0.25%, plus Dipel DF, 1 lb/A; Lannate LV 2.4WSL, 48 fl oz/A, plus COC 0.5%. 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 43.1 gallons per acre. Due to soil conditions that were too wet for the R&D Plot Sprayer, a backpack sprayer was used for the second, fifth, and sixth sprays, with a spray volume of 44.1 gal/A. Because rainfall was frequent and excessive (Table 2), no supplemental irrigation was needed.

Treatments were evaluated for damage caused by thrips by rating a sample of five randomly selected heads per plot at harvest on 17 August. Heads were weighed by processing standards, with wrapper leaves removed. Each head was cut in half, and 10 layers of leaf were peeled back and examined individually for thrips injury. Thrips injury was rated on scale of 0 (no injury) to 5 (severe injury). Plant damage by caterpillars was rated on the same day, 17 August, on 5 plants per plot, using the Greene rating scale, as detailed

in the footnote of Table 4. Head weight, thrips injury, and caterpillar 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.

Fungicides applied to all plots were: on 22 June, Bravo Weatherstik, 1.5 pt/A, plus Kocide 3000, 2 lb/A; on 7 July, Manzate Prostick, 2 lb/A, plus Kocide 3000, 1 lb/A; on 23 July, Bravo Weatherstik, 1.5 pt/A, plus Kocide 3000, 0.75 lb/A; on 30 July, Quadris, 15 oz/A, plus Kocide 3000, 0.75 lb/A; on 5 August, Revus, 8 oz/A, plus Kocide, 0.75 lb/A.

Results and discussion:

Thrips are known to be more troublesome when weather is dry than when wet. Despite frequent rains in 2015, thrips injury was present on harvested cabbage but at a lower intensity than in previous trials that were done in drier years. 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 ($P = 0.0119$; Table 3). Among the four insecticide programs, thrips total injury did not vary significantly, but injury was slightly lower in the standard Radiant/ Movento/ Assail/ Lannate treatment and injury was slightly greater in the Radiant/ Exirel low rate/ Assail/ Lannate treatment. The number of leaves with any thrips injury was significantly higher in untreated plots than in the standard, cyclaniliprole, and Exirel high rate treatments, but the Exirel low rate treatment was not significantly different than untreated plots ($P = 0.04$; Table 3). The deepest leaf layer with any thrips injury showed no significant treatment effect ($P = 0.13$; Table 3). The deepest leaf layer with an injury rating greater than 1, which ignores the lightest damage, showed no significant treatment effect ($P = 0.10$; Table 3). The weight per head showed significantly lower weight in untreated plots and in the Exirel high rate treatment, and significantly higher weight in the Exirel low rate and cyclaniliprole treatments, and intermediate weight in the standard treatment ($P = 0.03$, Table 3).

Caterpillars were effectively controlled by all insecticide programs, which all had damage ratings that were significantly lower than the untreated control ($P < 0.0001$; Table 4). Among the four insecticide programs, caterpillar damage was significantly less in the cyclaniliprole and Exirel high rate treatments than in the standard treatment, and intermediate in the Exirel low rate treatment.

In conclusion, Exirel, as the second product in a program of four products, performed as well at the low rate of 13.5 fl oz/A as at the higher rate of 16.9 fl oz/A for thrips control as well as for caterpillar control. Use of Exirel at this lower rate will be more economical for growers. The experimental compound cyclaniliprole will be a welcome alternative to other products for control of thrips as well as caterpillar pests, once it becomes registered.

Acknowledgements: Thanks to Matt Hofelich and his field crew for crop establishment and maintenance, to Frank Thayer and Bob Shaw for applying treatments, and to Susan Ndiaye, Mike McFarland, and Chad Kramer for technical assistance with insect evaluations. Funding and products were supplied by E. I. du Pont de Nemours and Company and ISK Biosciences. We appreciate insecticide product donations from Dow AgroSciences LLC, United Phosphorus, Inc., Bayer CropScience, and Valent U.S.A. Corporation.

Table 1. Insecticide treatments for trial on thrips control on cabbage at Fremont, Ohio, 2015.

Treatment	Sprays 1 & 2 (10 and 20 days after transplanting: 5/22 & 6/3)	Sprays 3 & 4 (30 and 40 days after transplanting: 6/12 & 6/22)	Sprays 5 & 6 (50 and 60 days after transplanting: 7/2 & 7/16)	Sprays 7 & 8 (70 and 80 days after transplanting: 7/27 & 8/6)
1 untreated	-	-	-	-
2 standard	Radiant 1SC, 8 fl oz/A, + LI-700 0.25%	Movento 2SC, 5 fl oz/A, + LI-700 0.25%, + Dipel DF, 1 lb/A	Assail 30SG, 4 oz/A, + LI-700 0.25%	Lannate LV 2.4WSL, 48 fl oz/A, + COC 0.5%
3 Exirel low rate	Radiant 1SC, 8 fl oz/A, + LI-700 0.25%	Exirel 10SE (cyazypyr), 13.5 fl oz/A, + COC 0.5%	Assail 30SG, 4 oz/A, + LI-700 0.25%	Lannate LV 2.4WSL, 48 fl oz/A, + COC 0.5%
4 Exirel high rate	Radiant 1SC, 8 fl oz/A, + LI-700 0.25%	Exirel 10SE (cyazypyr), 16.9 fl oz/A, + COC 0.5%	Assail 30SG, 4 oz/A, + LI-700 0.25%	Lannate LV 2.4WSL, 48 fl oz/A, + COC 0.5%
5 cycla-niliprole	cyclaniliprole 50SL, 16.4 fl oz/A, + COC 0.5%	cyclaniliprole 50SL, 16.4 fl oz/A, + COC 0.5%	cyclaniliprole 50SL, 16.4 fl oz/A, + COC 0.5%	cyclaniliprole 50SL, 16.4 fl oz/A, + COC 0.5%

Table 2. Rainfall during cabbage trial at the North Central Agricultural Research Station (NCARS) of the Ohio Agricultural Research and Development Center (OARDC) in Sandusky County near Fremont, Ohio, 2015.

Date	Rainfall (inch)
5/27	0.65
5/31	2.55
6/8	0.45
6/10	0.40
6/12	0.45
6/14	0.85
6/16	1.00
6/28	4.05
6/29	0.25
7/7	0.70
7/9	3.00
7/12	1.20
7/14	0.60
7/17	0.30
7/19	0.15
8/3	1.00
8/10	0.25
8/11	0.25
8/15	0.20

Table 3. Thrips injury on cabbage heads at harvest on 17 August 2015 at Fremont, Ohio.

Treatment (sequence of products and number of sprays of each)	Thrips total injury rating (sum of ratings on 10 leaves)[a]	Number of leaves with any injury[a]	Deepest layer with any injury	Deepest layer with rating >1	Weight per head, kg[a]
Standard: Radiant(2)/ Movento(2)/ Assail(2)/ Lannate(2)	1.02 B	1.1 B	1.6	0.2	1.76 AB
Cyclaniliprole (8)	1.50 B	1.2 B	1.9	0.6	1.93 A
Exirel high rate: Radiant(2)/ Exirel(2)/ Assail(2)/ Lannate(2)	1.60 B	1.6 B	3.2	1.2	1.69 B
Exirel low rate: Radiant(2)/ Exirel(2)/ Assail(2)/ Lannate(2)	1.65 B	1.8 AB	2.7	0.2	1.95 A
Untreated	3.82 A	3.2 A	4.0	1.3	1.66 B
P value, treatment effect	*P = 0.0119*	*P = 0.0405*	*P = 0.13*	*P = 0.10*	*0.0390*

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

Table 4. Ratings of caterpillar feeding damage on cabbage plants on day of harvest (17 August 2015), at Fremont, Ohio; mean of 5 plants per plot.

Treatment (sequence of products and number of sprays of each)	Greene scale rating[a, b]
Cyclaniliprole (8)	1.0 C
Exirel high rate: Radiant (2) / Exirel (2) / Assail (2) / Lannate (2)	1.0 C
Exirel low rate: Radiant (2) / Exirel (2) / Assail (2) / Lannate (2)	1.1 BC
Standard: Radiant (2) / Movento + Dipel (2) / Assail (2) / Lannate (2)	1.2 B
Untreated	3.7 A
P value for treatment effect	*<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 the column, means followed by same letter are not significantly different (*P* > 0.05); mean separations by LSD.