Onion thrips control on cabbage in Ohio

Final report 12/31/2012

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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 as registrations develop.

Methods:

The cabbage variety 'Cheers' was seeded in 200-cell plug trays on 16 April. 'Cheers' is an 85-day, widely used fresh- market variety that is moderately susceptible to thrips. Plots were established by transplanting on 21 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. Within-row plant spacing was 12 inches. There were eight 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 a sequence of three products: Movento, Radiant, and Assail, each with two consecutive applications. Due to rapid crop growth under unusually warm conditions in early summer, the planned six-spray program was shortened to five sprays by omitting the second planned spray and using the planned third spray instead. All insecticides used for thrips control were assumed to have adequate activity for caterpillar control, with the exception of Movento; Dipel was used with Movento to control caterpillars.

Insecticides were sprayed every two weeks starting two weeks after transplanting. The insecticide programs used are summarized in Table 1. Rates of insecticides and adjuvants used were Exirel 10SE (cyazypyr), 16.9 fl oz/A, plus COC 0.5%; Radiant 1SC (spinetoram), 8 fl oz/A, plus LI-700 0.25%; Assail 30SG (acetamiprid), 4 oz/A, plus LI-700 0.25%; Movento 2SC (spirotetramat), 5 fl oz/A, plus DyneAmic 0.25%, plus Dipel DF (*Bacillus thuringiensis*), 1 lb/A; Hero 1.24EC (bifenthrin plus zeta-cypermethrin), 7.7 fl oz/A, plus NIS 0.125%. Insecticides were applied by a boom sprayer that delivered 43.6 gallons per acre, with the exception of the second spray that was applied by a CO_2 backpack sprayer due to wet field conditions. Treatments were not evaluated for caterpillar control. Treatments were evaluated at harvest on 15 August by rating a sample of five randomly selected heads per plot. Heads were weighed by fresh-market standards, with four wrapper leaves intact. Each head was cut in half, the wrapper leaves removed, then 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). 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 9.1 microcomputer statistics program.

Table 1. Schedule of sprays in cabbage insecticide trial, 2012.

Treatment number	Spray 1, 4 June (2 weeks after transplant)	Spray 2, 18 June (4 weeks after transplant)	Spray 3, 2 July (6 weeks after transplant; at cupping)	Spray 4, 16 July (8 weeks after transplant)	Spray 5, 30 July (10 weeks after transplant)
1 (untreated)	-	-	-	-	-
2 (standard)	Movento + Dipel	Radiant	Radiant	Assail	Assail
3	Movento + Dipel	Exirel	Exirel	Assail	Assail
4	Exirel	Radiant	Radiant	Assail	Assail
5	Exirel	Exirel	Exirel	Exirel	Exirel
6	Radiant	Radiant	Radiant	Radiant	Radiant
7	Hero	Hero	Hero	Hero	Hero
8	Assail	Assail	Assail	Assail	Assail

Fungicides applied to all plots were Bravo Weatherstik at 1.5 pt/A plus Kocide 2000 at 1 lb/A on 6/20/12; Kocide 2000 at 1 lb/A plus Manex at 1.6 qt/A on 6/27/12; Quadris at 6.2 oz/A plus Kocide at 1 lb/A on 7/2/12; Bravo at 1.5 pt/A plus Kocide at 1 lb/A on 7/10/12; Quadris at 8 oz/A on 7/16/12; Manzate Prostik at 1.75 lbs/A on 7/24/2012; and Quadris at 8 oz/A on 7/30/2012.

Dates and amounts of rainfall and overhead irrigation are shown in Table 2.

Table 2. Rainfall and overhead irrigation applied to cabbage insecticide trial, 2012.

Date	Rainfall	Irrigation
6/14/12	-	1.1 inch
6/17/12	0.55 inch	-
6/18/12	0.35 inch	-
6/21/12	0.7 inch	-
7/1/12	0.25 inch	-
7/3/12	0.15 inch	-
7/6/12	-	0.9 inch
7/17/12	-	1.1 inch
8/1/12	-	1.1 inch
8/5/12	1.3 inch	-
8/10/12	1.1 inch	-
8/14/12	0.85 inch	-

Results and discussion:

There was significantly more injury by thrips in untreated plots than in all insecticide treatments except Hero-only, as measured by the thrips total injury rating, which is the sum of individual ratings on each of the ten outermost leaves; injury was least in the Exirel-only and Radiant-only treatments ($P < 0.0001$; Table 3). The number of leaves with any thrips injury showed similar trends, with the least injury in Exirel-only plots and the most injury in Hero-only and untreated plots ($P < 0.0001$). The deepest leaf layer with any injury (rating > 0) also showed similar trends, with the least injury in Exirel-only and Radiant-only plots and the most injury in Hero-only and untreated plots ($P < 0.0001$). The deepest leaf layer with an injury rating greater than 1, which ignores the lightest damage, showed similar trends, with the least injury in Exirel-only plots and the most injury in Hero-only and untreated plots ($P = 0.0024$). The weight per head did not show any significant treatment effect ($P = 0.20$).

Exirel positioned in the middle of the standard spray program (sprays 2 and 3) provided better thrips control than when positioned at the start of the spray program (spray 1). This difference was significant as measured by the number of layers with any injury, but not statistically different as measured by the other three variables.

In conclusion, Exirel will be a welcome alternative to other products for control of thrips as well as other key cabbage pests, once it becomes registered. The poor performance of Hero suggests that the onion thrips population has developed resistance to pyrethoids, which has been suspected in recent years.

Table 3. Thrips injury on cabbage heads at harvest on 15 August 2012 at Fremont, Ohio.

Treatment	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]	Weight per head, kg
Exirel only (5 sprays)	0.6 C	0.5 F	1.0 D	0.3 C	2.058
Radiant only (5 sprays)	1.0 C	0.8 EF	1.0 D	0.4 BC	1.986
Movento(1)/Exirel(2)/Assail(2)	1.7 BC	1.4 DEF	2.5 C	0.8 BC	2.223
Movento(1)/Radiant(2)/Assail(2)	1.9 BC	1.6 CDE	2.8 C	0.8 BC	2.024
Assail only (5 sprays)	3.2 B	2.4 CD	3.6 ABC	1.5 BC	1.963
Exirel(1)/Radiant(2)/Assail(2)	3.6 B	2.6 BC	3.6 BC	1.8 AB	1.950
Hero only (5 sprays)	5.8 A	3.8 A	5.0 A	3.1 A	2.050
Untreated	6.6 A	3.6 AB	4.2 AB	3.0 A	1.879
P value for treatment effect	*<0.0001*	*<0.0001*	*<0.0001*	*0.0024*	*0.20*

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

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 Emily Linkous, Mackenzie Dorner, and Greg Holthaus for technical assistance with insect evaluations. Funding and products were supplied by E. I. du Pont de Nemours and Company, Dow AgroSciences LLC, FMC Corporation, and United Phosphorus, Inc. We appreciate seed donation from Rupp Seeds, and insecticide product donations from Bayer CropScience and Valent U.S.A. Corporation.