Report to the Ohio Vegetable & Small Fruit Research & Development Program, 4 January 2008

Project Title: **Cucumber beetle management by an early-season trap-out strategy**

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Objective: Evaluate whether damage to cucurbit seedlings can be significantly reduced by use of a pre-plant trap-out strategy.

Background:

Cucumber beetles are the key insect pest of cucumber, pumpkin, and other cucurbit crops due to their direct feeding damage plus their vectoring of bacterial wilt disease. Many growers use soil-applied systemic insecticides such as Admire or Furadan for preventive control of beetles. For growers who do not use soil insecticides due to environmental concerns or high cost, a possible alternative is a trap-out strategy, but information has not been available about whether this is effective enough to reduce damage by beetles. A kairomone trap is available that uses an attractant lure that mimics cucurbit flowers, plus a poison made of cucurbitacin plus a low dose of carbaryl insecticide. The traps attract striped cucumber beetle, spotted cucumber beetle, western corn rootworm beetle, and northern corn rootworm beetle.

Preliminary tests in Ohio in 2003 compared beetle catch in the traps versus on potted seedlings treated with a soil drench of Admire; treatments were the trap alone, the potted plants alone, and a combination of trap and plants. We found that the traps alone or plants alone catch some beetles, but significantly more beetles are trapped when a trap is placed next to potted seedlings. There were as many as 769 beetles caught in one trap/plant combination in an 11-day period. In the 2003 test, beetle damage to crop plants near the traps was not evaluated. The trap treatments were spaced at least 150 feet apart in the 2003 test, so that they did not interfere with each other, but for a trap-out strategy, the traps should be more numerous and placed closer together.

This experiment was done to evaluate whether cucurbit crop damage could be significantly reduced by removal of beetles into traps before the beetles attack the crop, so that growers could benefit from an alternative control strategy. This would be of particular interest to organic growers or growers who prefer to minimize use of insecticides. Although the poison in the commercially available trap is not acceptable to organic growers, it might be possible to substitute an alternative poison that would be acceptable to organic growers.

Methods:

An experiment was established in three fields of vine crops. Each trial was set up in a randomized complete block design with two treatments and three or four blocked replicates. The two treatments were trapout and non-trapout. Plots in the trap-out treatment had beetle trapping stations spaced every 20 feet along one edge of the plot; a trapping station was one kairomone trap (Trécé Inc.), baited with lure TR9257, next to one plastic box holding three potted squash seedlings treated with a soil drench of Admire insecticide. Plants in the center of each plot were scouted weekly from late May until late June to evaluate damage by beetles and bacterial wilt symptoms. Beetles caught in kairomone traps and at the base of potted treated seedlings were counted by species twice per week from early May until late June.

The trial at a 40-acre commercial field of pickling cucumbers near Circleville was established along the west edge of the field, which was adjacent to the previous year's pickle field. There were four blocked replicates. Each plot was 100 ft wide, and there was a 100-ft buffer between each trapout plot and each non-trapout plot. Each trapout plot had five trapping stations that were deployed on 5/3. The field was seeded on 5/5 and machine harvested on 7/3. No insecticide was used at planting.

The two pumpkin trials at OSU's Waterman Lab, Columbus were established in two adjacent 1-acre fields. There were three blocked replicates in each field. The south field had trapping stations along its southern edge, and no insecticides were used at planting on 5/24. The north field had trapping stations along its northern edge, and Admire was used at planting on 5/31. Each plot was 60 ft wide, and there was a 50-ft buffer between each trapout plot and each non-trapout plot. Each trapout plot had three trapping stations.

Results:

At the pickle field near Circleville, 15,099 beetles were removed by the 20 trapping stations over a 2-month period, for an average of 755 beetles per station. The number of beetles removed was low for the first two weeks but surged greatly from 5/25 to 6/1 when removal averaged 46 beetles per trapping station per day (Table 1). The beetles were 98% striped cucumber beetle during the surge in late May. There was another smaller surge in late June that was 50% striped cucumber beetle and 50% spotted cucumber beetle.

At the pumpkin fields in Columbus, the number of beetles removed was lower. At the pumpkin field in which insecticide was not used, 3864 beetles were removed by the 9 trapping stations over a 2-month period, for an average of 429 beetles per station (Table 2). At the pumpkin field in which insecticide was used at planting, 1560 beetles were removed by the 9 trapping stations over a 2-month period, for an average of 173 beetles per station (Table 2). Although the two fields were adjacent, the time of increased beetle activity was different in the two fields: there was a peak on 5/28 in the field with insecticide and on 6/4 for the field with no insecticide. The beetle population at the time of the peak in late May and early June was about 50% striped cucumber beetle and 50% spotted cucumber beetle, but during the surge in late June the population was about 70% striped cucumber beetle and 30% western corn rootworm beetle (Table 3).

At both sites, the number of striped cucumber beetle was usually higher on Admire-treated potted squash plants than in the kairomone traps, but the trend in spotted cucumber beetle was the opposite, with higher numbers caught in the traps than in the treated potted plants (Tables 1, 3). Western corn rootworm beetles were also caught in larger numbers in traps than on potted treated plants (Table 3).

Data on beetle damage to seedlings in plots with trapping stations versus without trapping stations has not yet been analyzed but will be presented at the Growers Congress in January 2008. The general observation was that despite the large number of beetles removed by trapping stations, damage to the crop was no different in areas next to traps than in areas not next to traps.

Table 1. Cucumber beetle removal by trapping stations along a commercial field of pickling cucumber, Circleville, Ohio, 2007.

Date	Total number of beetles caught in 20 stations	Mean number of beetles per trapping station per day	Mean number of beetles per trapping station per day, by species and by location within trapping station				% of population that was striped cucumber beetle
			striped cucumber beetle in trap component	striped cucumber beetle in plant component	spotted cucumber beetle in trap component	spotted cucumber beetle in plant component	
5/7	22	0.3	0.1	0.0	0.2	0.0	40
5/11	218	2.7	0.1	2.5	0.1	0.1	95
5/15	21	0.3	0.0	0.3	0.0	0.0	100
5/18	12	0.2	0.0	0.1	0.0	0.0	80
5/22	88	1.1	0.1	0.8	0.2	0.1	77
5/25	3058	51.0	1.0	47.9	1.0	0.1	98
5/29	2957	37.0	4.0	32.2	0.6	0.2	98
6/1	2985	49.8	6.0	42.1	1.5	0.2	97
6/5	432	5.4	0.9	2.2	1.9	0.5	57
6/8	221	3.7	0.2	1.2	1.7	0.6	39
6/12	932	15.5	1.2	2.7	10.1	1.6	25
6/15	528	8.8	0.7	1.1	4.6	2.4	20
6/18	805	13.4	0.7	1.3	8.1	3.3	15
6/22	1022	12.8	1.7	3.3	5.0	2.8	39
6/26	1081	13.5	3.6	4.4	4.6	1.0	59
6/28	717	17.9	5.2	9.1	3.0	0.8	79
total	*15,099*						

Table 2: Cucumber beetle removal by trapping stations along pumpkin fields at OSU's Waterman Lab, Columbus, Ohio, 2007.

Date	Field with no Admire insecticide at planting		Field with Admire insecticide at planting	
	Total number of beetles caught in 9 stations	Mean number of beetles per trapping station per day	Total number of beetles caught in 9 stations	Mean number of beetles per trapping station per day
5/18	0	0.0	0	0.0
5/21	7	0.3	1	0.0
5/24	66	2.4	80	3.0
5/25	17	1.9	30	3.3
5/26	6	0.7	10	1.1
5/28	8	0.4	142	7.9
5/30	16	0.9	72	4.0
6/1	42	2.3	68	3.8
6/4	259	9.6	145	5.4
6/6	67	3.7	33	1.8
6/8	126	7.0	66	3.7
6/11	56	2.1	27	1.0
6/15	132	3.7	23	0.6
6/18	505	18.7	42	1.6
6/20	556	30.9	45	2.5
6/22	307	17.1	20	1.1
6/25	939	34.8	114	4.2
6/27	378	21.0	209	11.6
6/29	296	16.4	276	15.3
7/2	81	3.0	157	5.8
total	*3,864*		*1,560*	

Table 3. Mean number of beetles per trapping station per day, by species and by location within trapping station for beetle trap-out trial in pumpkin fields at OSU's Waterman Lab, Columbus, Ohio, 2007.

Date	Field with no Admire insecticide at planting						Field with Admire insecticide at planting					
	striped cucumber beetle		spotted cucumber beetle		western corn rootworm beetle		striped cucumber beetle		spotted cucumber beetle		western corn rootworm beetle	
	trap	plants	trap	plants	trap	plants	trap	plants	trap	plants	trap	plants
5/18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/21	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5/24	0.2	1.8	0.4	0.0	0.0	0.0	0.9	1.8	0.3	0.0	0.0	0.0
5/25	0.0	1.0	0.9	0.0	0.0	0.0	0.1	1.7	1.3	0.2	0.0	0.0
5/26	0.0	0.6	0.1	0.0	0.0	0.0	0.1	0.6	0.3	0.1	0.0	0.0
5/28	0.0	0.0	0.5	0.0	0.0	0.0	10.9	6.4	19.9	15.4	0.0	0.0
5/30	0.0	0.0	0.9	0.0	0.0	0.0	0.2	2.6	1.3	0.0	0.0	0.0
6/1	0.1	0.4	1.7	0.2	0.0	0.0	0.2	2.0	1.5	0.2	0.0	0.0
6/4	0.9	3.0	5.2	0.4	0.0	0.0	0.1	0.3	4.9	0.1	0.0	0.0
6/6	0.2	1.9	1.4	0.3	0.0	0.0	0.0	0.3	1.3	0.3	0.0	0.0
6/8	0.3	1.7	5.0	0.1	0.0	0.0	0.1	0.2	3.4	0.1	0.0	0.0
6/11	0.2	0.2	1.6	0.0	0.0	0.0	0.0	0.1	0.8	0.1	0.0	0.0
6/15	0.3	1.1	2.1	0.2	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0
6/18	5.0	7.1	6.0	0.6	0.0	0.0	0.2	0.1	1.3	0.0	0.0	0.0
6/20	8.0	16.0	5.9	1.2	0.0	0.0	0.1	0.2	2.0	0.3	0.0	0.0
6/22	3.5	10.0	3.0	0.6	0.0	0.0	0.1	0.0	1.1	0.0	0.0	0.0
6/25	16.3	15.6	2.6	0.3	0.0	0.0	1.7	0.7	1.7	0.1	0.0	0.0
6/27	2.2	11.9	1.7	0.2	3.6	1.5	2.5	4.3	2.0	0.3	2.5	0.1
6/29	2.9	8.6	0.4	0.1	3.7	0.7	2.9	5.6	0.7	0.2	5.3	0.7
7/2	0.8	1.1	0.2	0.0	0.8	0.0	0.6	3.3	0.3	0.1	1.3	0.2