Squash vine borer control on zucchini in Ohio, 2008
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Celeste Welty & Jim Jasinski
Ohio State University

Introduction: Damage by squash vine borer is becoming more noticeable in commercial fields of pumpkins as well as in zucchini and other squash in Ohio. The adults lay eggs at the base of the plant; the eggs hatch into larvae that bore into the stem. Feeding inside the stem can result in a wilted vine or dead plant. The borer can be controlled with contact insecticides only if insecticide is applied prior to the larva entering the stem. The traditional extension recommendation is to spray two to four times in July with a pyrethroid or endosulfan insecticide. The objective of this project was to document the effectiveness of a weekly spray program, and to compare several foliar insecticides used to prevent squash vine borer infestation. Zucchini was chosen as the test crop because it known to be highly attractive to the squash vine borer, and it is better suited to small-plot spray work than pumpkins.

Methods: A field trial with four treatments and four replicates was set up in a randomized complete block design at the Ohio Agricultural Research and Development Center's Western Agricultural Research Station at South Charleston in Clark County. Plots were each two rows wide by 20 ft long, with rows 5 ft apart. Plots were direct seeded with 'Spineless Beauty' zucchini on 23 May 2008. All plots including the untreated control were treated with the maximum rate of Admire Pro (10.5 fl oz/A = 1.2 fl oz per 1000 ft) in-furrow for control of cucumber beetles. The stand was thinned to within-row plant spacing of 2 ft on 10 June. The adult population of squash vine borer was monitored by three pheromone traps: two that were a mesh cone 'Heliothis' style (Trécé Inc., Adair OK) and one that was a standard bucket 'Unitrap' style (Great Lakes IPM, Vestaburg MI); all traps were baited with lures made by Great Lakes IPM. The treatments were: a premix of bifenthrin plus zeta-cypermethrin (Hero 1.24EC; FMC Inc.), endosulfan (Thionex 3EC; Makhteshim Agan of North America Inc.), carbaryl (Sevin XLR, Bayer CropScience), and an untreated control. Insecticide treatments were applied by a tractor mounted boom sprayer using ConeJet nozzles with output of 33 gal/A at 50-55 psi. Application dates were 3, 11, 18, and 25 July. Fruit were harvested twice per week from all plots to keep the plants actively growing, but no harvest data were taken. All plants were evaluated destructively on 8 August by cutting the main stem to expose damage by borers. A second trial was conducted concurrently in a field adjacent to the first trial; it was identical except that fruit were never harvested and there were only three replicate blocks. Data were subjected to analysis of variance (ANOVA) using the SAS microcomputer statistics program (version 9.1), with mean separations by LSD. The angular transformation was used on percentage data before analysis.

Results: The squash vine borer population peaked on 9 July in traps (Table 1; Figure 1). More moths were caught in Heliothis traps than in the Unitrap. In the trial in which zucchini fruit were harvested regularly, 14.6% of the untreated plants were damaged by squash vine borer; all three insecticide treatments resulted in significantly less damage than the untreated control, and there were no significant differences among the three insecticide treatments (Table 2). In the second trial, in which zucchini fruit were never harvested, 53% of the untreated plants were damaged by squash vine borer; all three insecticide treatments resulted in significantly less damage than the untreated control treatment, and there were no significant differences among the three insecticide treatments (Table 3).

Discussion and Conclusions: A spray program of four applications at weekly intervals in July worked well to prevent damage by squash vine borer at a site with a moderately high population of the pest. Hero, Thionex, and Sevin provided statistically equivalent control, but there was a trend of the least damage in Hero plots. Although both trials were under identical treatment programs, much less borer injury was found in the trial in which fruit were harvested regularly. The reason for this is unknown, but perhaps related to a somewhat smaller canopy or greater stress in unharvested plants. These results suggest that actively harvested zucchini fields might have a lower risk for borer infestation, and that abandoned fields should be plowed under or mowed to avoid becoming a source for this pest. Alternatively, a strip of unharvested crop next to a commercial crop could act as a trap crop that might

reduce pest pressure in the commercial crop. A follow-up trial is needed to evaluate whether fewer sprays could achieve a similar level of borer control with these insecticide products.

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Table 1. Number of adult squash vine borer caught in pheromone traps, 2008, South Charleston, Ohio.

Date	*Heliothis trap 1 (southeast corner)*	*Heliothis trap 2 (northwest corner)*	*Unitrap (center of field)*	*Mean*
25 Jun.	1	1	-	1.0
2 Jul.	0	2	1	1.5
9 Jul.	18	14	3	11.7
16 Jul.	9	2	2	4.3
23 Jul.	2	1	2	1.7
30 Jul.	2	2	0	1.3
6 Aug.	3	2	0	1.7
13 Aug.	2	0	0	0.7
20 Aug.	0	0	0	0.0

Table 2. Injury by squash vine borer larvae in trial in which zucchini fruit were harvested regularly, 2008, South Charleston, Ohio.

Treatment	*Percentage of plants damaged (mean of 4 reps)* [a]
Hero 1.24EC, 5 oz/A	0.0 B
Thionex 3EC, 1.3 quarts/acre	2.7 B
Sevin XLR, 1 quart/acre	3.3 B
untreated	14.6 A
Probability of treatment effect by ANOVA	*P=0.0138*

[a] Within each column, means followed by same letter are not significantly different (*P*>0.05); mean separations by LSD. Values shown are actual percentages but ANOVA based on transformed values.

Table 3. Injury by squash vine borer larvae in trial in which zucchini fruit were not harvested, 2008, South Charleston, Ohio.

Treatment	*Percentage of plants damaged (mean of 3 reps)* [a]
Hero 1.24EC, 5 oz/A	0.0 B
Thionex 3EC, 1.3 quarts/acre	5.3 B
Sevin XLR, 1 quart/acre	15.0 B
untreated	53.0 A
Probability of treatment effect by ANOVA	*P=0.0040*

[a] Within each column, means followed by same letter are not significantly different (*P*>0.05); mean separations by LSD. Values shown are actual percentages but ANOVA based on transformed values.

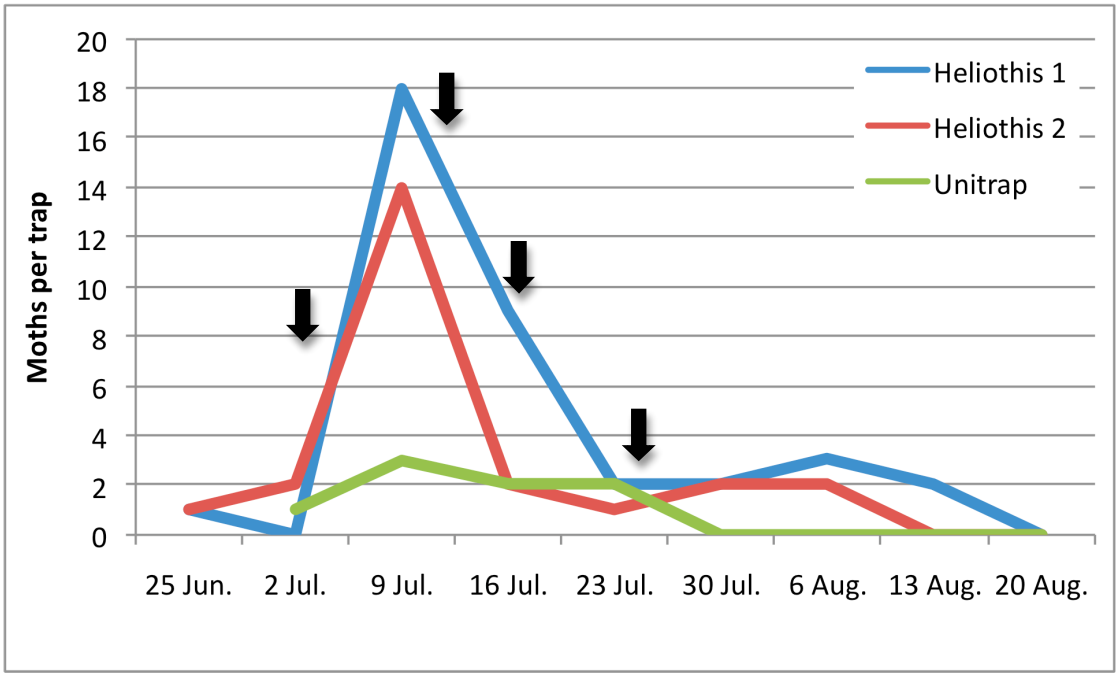

Figure 1. Weekly catch of adult squash vine borer in three pheromone traps in relation to insecticide applications (indicated by black arrows) on 3, 11, 18, and 25 July 2008, South Charleston, Ohio.