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Project title: Control of squash vine borer by insecticides

Principal investigator: Celeste Welty

Background: Squash vine borer is a pest that often kills squash plants by mid-summer. Although it does attack squash and pumpkins in large commercial fields, it is usually more destructive in gardens and small commercial plantings. Its damage can be reduced by planting late or using row covers, but insecticides can be used to control it. Insecticides do not always work well if the application timing is not appropriate. Little research has been published on which insecticides work best, and the best timing of insecticides. Information is particularly lacking on efficacy of the biorational and natural crop protection products that are available to gardeners. Biorational products include microbial or growth regulator products that are specific to a narrow range of arthropod species. Natural products are derived from plants or other natural sources, and are typically not biorational but are broad-spectrum with short residual activity. While it is known that these products are safer to humans than conventional pesticides, it is often not known whether they are effective in controlling target pests.

Objectives: To evaluate efficacy and timing of insecticide products for control of squash vine borer.

Methods:

Two field trials were conducted. Both trials used Blue Hubbard squash, which is the preferred host of squash vine borer. Seeds were started in 72-cell deep plug trays on 19 May. Plants were transplanted on 12 June. A post-transplant fertilizer drench was applied. Three pheromone traps were used to monitor the activity of the adult squash vine borer so that the first spray could be timed to coincide with first egg hatch. Treatments were applied from 5 July until 30 July. The experiment was terminated on 11 September when fruit were harvested and each plant was dissected to search for larvae and/or tunneling damage in the main stem and side stems.

The first trial used larger plots, a boom sprayer, and insecticides appropriate for commercial farms. Four insecticides and two timings were compared with an untreated check using a randomized complete block design with four replicates per treatment. The four insecticides were esfenvalerate (Asana XL 0.66EC; DuPont Co.) at 7.7 fl oz per acre, endosulfan (Thiodan 3EC; FMC Corp.) at 32 fl oz per acre, pyrethrins (Pyganic 1.4EC; McLaughlin Gormley King Co.) at 64 fl oz per acre, and pyrethrins + PBO (Evergreen 60-6EC; McLaughlin Gormley King Co.) at 16 fl oz per acre. The two timings were four sprays at 7-day intervals, and three sprays at 10-day intervals. The sprayer was a tractor drawn CO_2 pressurized sprayer operated at 60 psi pressure, with five TXVS-12 hollow cone nozzles covering a swath of 45 inches, which applied a spray volume of 84 gallons per acre. Each plot contained 10 plants spaced 3 feet apart, in rows spaced 15 feet apart.

The second trial used small plots, a hand held sprayer, and insecticides appropriate for market gardeners. Seven insecticides were compared with an untreated check using a randomized complete block design with five replicates per treatment. Plots were single squash plants spaced 8 feet apart in rows and 10 feet apart between rows, with one untreated guard plant between treatment plants. Treatments were applied by a hand-held sprayer directed at stems. Four products (carbaryl, esfenvalerate, permethrin, and endosulfan) were applied four times at 7-day intervals, while three products (pyrethrins + PBO, spinosad, and capsaicin) were applied six times at 4- to 5-day intervals. Five products were applied in the ready-to-spray bottle in which they were purchased: carbaryl (Garden Tech Sevin), esfenvalerate (Ortho Bug-B-Gon Max), permethrin (Bonide Eight), pyrethrins + PBO (Fertilome Red Spider and Mite Spray), and capsaicin (Bonide Hot Pepper Wax). Two products were diluted from concentrates: spinosad (Fertilome Borer Bagworm Killer), and endosulfan (Hi-Yield Thiodan).

Results:

Pest pressure from squash vine borer in the trials was not as heavy as expected. A few plants died from bacterial wilt in July. In the commercial squash trial, there were no significant differences among treatments in the yield of fruit or in the number of plants with borer damage (Table 1). The yield was slightly higher in plots treated with Asana every 7 days and with Evergreen every 7 days. The yield was slightly lower in plots treated with Thiodan on either a 7-day or 10-day schedule.

In the market garden trial, there were again no significant differences among treatments in the yield of fruit or in the number of plants with borer damage (Table 2). The yield was slightly higher in plots treated with Sevin every 7 days than in other plots.

Conclusions: The squash vine borer trials were inconclusive under conditions of light pest pressure, but there was a trend of higher yield when Asana was sprayed on a 7-day schedule in the commercial trial, and higher yield when Sevin was sprayed on a 7-day schedule in the market garden trial.

Table 1. Squash vine borer control by insecticides in field trial on commercial Blue Hubbard squash, mean of four replicates at OSU's Waterman Laboratory, Columbus, Ohio, 2006.

Treatment product and spray interval	Weight of fruit (kg) per plot	Number of fruit per plot	Number of plants per plot with SVB damage	Number of live plants per plot at harvest
Esfenvalerate (Asana), 7-day	27.0	9.8	0.2	9.8
Pyrethrins+PBO (Evergreen), 7-day	26.2	9.2	1.2	9.2
Pyrethrins (Pyganic), 10-day	22.3	9.2	1.2	9.8
Pyrethrins (Pyganic), 7-day	22.1	8.5	0.8	8.8
Esfenvalerate (Asana), 10-day	21.1	8.2	0.2	9.0
Untreated	17.6	7.0	1.2	8.5
Endosulfan (Thiodan), 10-day	17.3	7.5	0.8	8.0
Endosulfan (Thiodan), 7-day	16.4	8.5	0.5	9.2
Probability value for treatment effect from ANOVA	*P = 0.21*	*P = 0.22*	*P = 0.43*	*P = 0.15*

Table 2. Squash vine borer control by insecticides in field trial on market garden Blue Hubbard squash, mean of five single-plant replicates at OSU's Waterman Laboratory, Columbus, Ohio, 2006.

Treatment product and spray interval	Weight of fruit (kg) per plot	Number of fruit per plot	SVB damage[a]
Carbaryl (Sevin), 7-day	9.5	1.8	0.2
Untreated	9.2	2.0	0.4
Permethrin (Eight), 7-day	8.8	2.0	0.4
Capsaicin (Hot Pepper Wax), 5-day	7.5	1.8	0.2
Esfenvalerate (Bug-B-Gon), 7-day	6.0	1.8	0.4
Pyrethrins+PBO (Red Spider & Mite Spray), 5-day	5.1	1.2	0.2
Spinosad (Borer Bagworm Killer), 5-day	4.9	1.2	0.2
Endosulfan (Thiodan), 7-day	4.5	1.2	0.2
Probability value for treatment effect from ANOVA	*P = 0.14*	*P = 0.70*	*P = 0.98*

[a] Damage rating: 1= damage; 0 = no damage.