Management of Bacterial Wilt of Muskmelon with Row Covers and Organic Insecticides

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Cucurbit crops, including melons, squash, cucumbers, and pumpkins, comprise one of the most important groups of vegetable crops. Cucumber beetles are the most damaging insect pests of cucurbits in much of the U.S. Direct feeding damage can destroy young plants and ruin fruits. Cucumber beetle adults also transmit bacterial wilt (pathogen: *Erwinia tracheiphila*), to which muskmelons and other cucurbits are highly susceptible and can suffer great losses. *E. tracheilphila* enters the vascular system and blocks water movement, causing plants to wilt and die.

Bacterial wilt management depends on frequent insecticide applications to control cucumber beetles because no bactericides have been developed and wilt resistance in muskmelon and cucumbers either has not been identified or is not commercially available. Current cucurbit management guides recommend up to 15 pesticide applications per season. Pesticide is usually applied to coincide with the appearance of the first beetles, and will continue throughout the season. This intensive regime poses serious applicator health risks, kills non-target organisms, and endangers the general population through residues on produce and pollution of drinking water. Pesticide applications do not meet the intent or requirements of organic production.

One management strategy to reduce insecticide applications directed towards cucumber beetles is row covers. Consisting of plastic or semi-permeable cloth, row covers are placed over the crop row and the edges are secured with soil. While it is in place, the material provides a barrier to most insect pests not already present on plants or in the soil. For certain vegetables, row covers have led to earlier harvest and increased yields through the exclusion of harmful insects, reduction of insect-vectored diseases, and increased yields through higher temperatures. The objective of this study was to determine the effect of row covers in combination with insecticides on cucumber beetle populations, incidence of wilt, and the number and weight of harvested muskmelons.

Fields were established in Armstrong, Ames, and Muscatine, IA in 2003 and 2004. At each location, two fields were planted a minimum of 1000 ft. away from existing muskmelon fields or location of muskmelons fields from the previous year. The experiment was set up in a split-plot randomized complete block design with four replications. Immediately after transplanting, one field at each location was covered with Reemay spun cotton row cover, which was the main plot. Row covers were supported by wire hoops and removed at bloom. Insecticide treatments were subplots and were randomized within four blocks (reps) within each field. These treatments included a non-treated control, a conventional control (Sevin in 2003 and Sevin alternated with Capture in 2004) and an organically approved insecticide (Entrust). All plots, except the non-treated control, received the first spray immediately after planting in the non-covered field and immediately after row covers were removed in the covered field. Subsequent treatments were applied at 14-day-intervals until harvest. Plot maintenance followed recommendations from the 2005 Midwest Vegetable Production Guide for Commercial Growers.

Data were taken from the middle row of each plot. Striped and spotted beetle populations on five plants per plot, as well as the number of plants with bacterial wilt and overall plant number per plot were recorded once each week. The number and weight of both marketable and cull melons harvested per plot was measured twice per week at maturity.

Table 1. Effect of row cover and insecticide on striped and spotted cucumber beetle populations and muskmelon production

Treatment	Striped beetle [z]	Spotted beetle [z]	Melon Number	Melon weight (lb)	% Melons Marketable
Row cover	0.34 a	0.53 a	26.7 a	145.7 a	75.4 a
No cover	0.47 b	0.35 b	19.6 b	112.0 b	68.5 b
Insecticides					
Entrust	0.42 a	0.40 a	23.0 a	126.4 a	74.4 a
Conv. insecticide [y]	0.37 a	0.39 a	24.9 a	141.1 a	74.7 a
Non-treated control	0.39 a	0.44 a	20.0 b	110.2 b	63.6 b

[z] Weekly averages per plant

[y] Conventional insecticide in 2003 was Sevin and in 2004 was Sevin alternated with Capture

Plants in rows covered had more spotted cucumber beetles and less striped beetles than plants in rows not covered. There were no significant differences in beetle populations with any insecticide treatment compared to the non-treated control. There were no significant differences between conventional insecticide and Entrust (Table 1).

The incidence of bacterial wilt was higher in plots with no row covers at both 20 days prior to harvest and at harvest. Twenty days prior to harvest, bacterial wilt was estimated at 8.5% for plots with no row cover and 0.8% for plots with row cover. At the end of the season plots with no row cover had an average of 15.9% bacterial wilt compared to 7.2% for plots with row cover. In 2003, there was no significant difference in bacterial wilt both 20 days prior to harvest and at harvest. In 2004 for both 20 prior to harvest and at harvest, the conventional insecticide (1.0, 5.2%) had significantly lower incidence of wilt compared to the non-treated control (6.6, 25.1%) and Entrust (9.1, 18.9%). There were no significant differences between the non-treated control and Entrust at either date.

There were more marketable melons and more melon weight from plots that were covered than plots that were not covered. Plots treated with Entrust and the conventional insecticide had significantly more melons and more melon weight than the non-treated control (Table 1).

This is the first report of row covers having a direct effect on bacterial wilt. Additionally, plots with row covers had more melons, and more importantly, more marketable melons than plots with no row cover.

Publications Resulting From This Work

Gleason, M. L., Mueller, D. S., Havlovic, B., Lawson, V. 2005. A row cover and low-risk insecticide strategy for cucumber beetle management. Annual Fruit/Vegetable Progress Report 2004. Iowa State University Extension: FG 601: 37-38.