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Organic Practices for the Production of Muskmelon

Abstract
Cucurbit crops, especially muskmelon, are difficult to grow due to bacterial wilt (Erwinia tracheiphila). This disease is vectored by the cucumber beetle, both spotted and striped. The highest risk period for disease infection is early in the season when adult beetles emerge from overwintering in the ground and begin feeding on young cucurbit plants.

Keywords
Plant Pathology and Microbiology

Disciplines
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Organic Practices for the Production of Muskmelon

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Introduction

Cucurbit crops, especially muskmelon, are difficult to grow due to bacterial wilt (*Erwinia tracheiphila*). This disease is vectored by the cucumber beetle, both spotted and striped. The highest risk period for disease infection is early in the season when adult beetles emerge from overwintering in the ground and begin feeding on young cucurbit plants.

Row covers usually are placed on muskmelon transplants the same day as planting. Row covers are then either removed at anthesis (when 50% of the plants exhibit/display female flowers) or left on plants for 10 more days. Delayed row cover removal has been shown to provide an additional period of protection while allowing for the blossoming flowers to be pollinated. Although row covers have provided excellent bacterial wilt control in our previous studies, the marketable harvest is usually reduced by picnic and cucumber beetle feeding on ripening fruit. Row covers provide a physical barrier to deter the beetles before fruit development. Organic pesticides provide a chemical approach throughout the season.

In an effort to provide organic farmers effective tools with which to manage bacterial wilt and late-season beetle feeding, two approaches for beetle control were examined in this experiment—early-season row covers and late-season organic pesticides. Row covers provided a physical barrier to deter the beetle, and organic pesticides (Surround, Pyganic, and Trilogy) provided a chemical tool against this common disease vector. This study is the first year of a two-year study conducted in Iowa and Ohio.

Materials and Methods

Transitioning organic land was used for the multi-factorial experimental plot at the ISU Horticulture Research Station, Ames, Iowa. On May 10, 2014, 1.5 cubic yards of composted dairy manure was incorporated into the soil. On May 19, 5-wk-old organic transplants of Athena muskmelon were planted 2 ft apart in black plastic mulch with drip irrigation and 7-ft centers. Subplots consisted of 30-ft-long rows of 15 plants. Spunbond polypropylene row covers (Agribon® AG-30) were installed on wire hoops immediately after transplanting. Weed management was achieved with 6 in. of corn stalk mulch between rows. The organic certified fungicide Champ WG was applied three times for anthracnose.

The experimental design was a two factorial randomized design using 24 subplots (4 replicates × 3 row cover treatments × 2 insecticide treatments) that measured 110 × 60 ft. Row cover treatments included: 1) no row covers (NRC), 2) row covers applied at transplanting and removed at anthesis (when female flowers start to open) (RC), and 3) row covers applied at transplanting with the ends opened at anthesis and removed 10 days later (DRC). Row covers were removed June 20 for the RC treatment and June 30 for the DRC treatment. The second factor was two insecticide regimes: 1) Surround (kaolin clay) was maintained on the plants and the coating was reapplied after rain, and 2) Surround was applied as the previous treatment, but Pyganic EC (pyrethrin) and Trilogy (neem oil) were applied when cucumber beetle thresholds exceeded 0.5/plant before anthesis, 3/plant from anthesis to vine touch and 10/plant from

vine touch to harvest. Insecticides were not applied while plants were under row covers. Striped and spotted cucumber beetle adults were counted weekly from transplant through the beginning of harvest using yellow sticky cards and weekly visual monitoring of three randomly chosen plants/subplot. Disease incidence was monitored weekly. Melons were harvested twice weekly from July 25 to August 25. The number and weight of marketable and cull melons harvested from each subplot was recorded.

Results and Discussion

A constant coating of Surround alone was as effective as additional insecticides in preventing insect damage to harvested fruit. However, the eight applications of Surround on plots with no row covers was not as effective in controlling bacterial wilt as the three and four applications of Surround for the DRC and RC, respectively. Insecticide treatment (Surround only vs. Surround with additional Pyganic and Trilogy) did not affect insect cull, melon yield, or bacterial wilt incidence and there was no interaction of row cover and insecticide treatment. Therefore, we combined the insecticide treatments for each row cover treatment analyses. Cucumber beetles first entered the plot on June 10 and were present throughout the season. Thresholds were exceeded three times and additional Pyganic and Trilogy sprays were applied 2 and 3 times for DRC and RC, respectively.

Row covers were highly effective, doubling marketable and total yield weight (Table 1) and reducing 4 or 5 insecticide sprays. Delaying the row cover removal saved one Surround spray, but did not significantly reduce bacterial wilt or enhance yield. Increased yield under the row covers was due to protection from three hailstorms, flooding, high winds, cool temperatures, and heavy beetle and bacterial wilt pressure.

Table 1. Effects of row cover treatments on mean marketable and total yield, insect cull number as a percentage of total harvest, and bacterial wilt incidence per 30-ft plot, for organically grown muskmelon cv. Athena in 2014 at the ISU Horticulture Research Station.

		Marketable yield		Total yield			
Row Cover[a]	N[b]	Weight (lb)[c]	Number[c]	Weight (lb)[c]	Number[c]	Percent insect cull number[c]	Bacterial wilt incidence[c]
NRC	8	24.3 a	5.9 a	39.7 a	12.6 a	7.0 a	8.6 a
DRC	8	45.3 b	10.5 b	63.2 b	18.6 b	6.9 a	0.5 b
RC	8	56.9 b	13.6 c	74.8 c	21.0 b	5.3 a	2.4 b
LSD		14.1	3.0	11.4	3.6	6.6	2.1

[a]No row cover (NRC) treatments served as controls. Delayed removal row covers (DRCR) consisted of spunbond polypropylene row covers (Agribon-30) covering the transplants within 24 hours planting, opening ends at anthesis and removed 10 days after anthesis. Row cover (RC) consisted of spunbond polypropylene row covers (Agribon-30) covering the transplants within 24 hours planting and removed at anthesis (female flowering).

[b]No significant differences in yield, insect culls, or disease were observed between insecticide treatments, and because there was not interaction of insecticide and row cover treatments, insecticide treatments were combined for each row cover treatment.

[c]Differing letters in each column significantly ($P < 0.05$) differ based on protected least significant difference critical values.