Effects of Scaling Up Row-cover Removal Timing in Conventionally Grown Muskmelon

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Introduction

Row covers are most often placed manually over muskmelon transplants and then removed at anthesis (the period at which 50% of plants have female flowers). Row covers protect muskmelons from bacterial wilt (vectored by cucumber beetles), early season frost, wind damage, and fungal diseases. However, the intensive labor needs of row cover deployment have limited their use to small fields on small-scale farms. In order to expand the use of row covers to large-scale farms, we are assessing the possibilities of using simple machinery to assist in the deployment and retrieval of the row covers.

Previous research with small plots of muskmelon has shown row covers reduce bacterial wilt and the number of sprays, as well as increase yield and earliness. However, insect control after row cover removal has not been addressed. Here we report a portion of a 2-year study with the University of Kentucky to optimize the benefits of row cover use for larger-scale muskmelon farmers. We examined the impacts row covers have on insect and disease control and yield on a conventionally managed large-scale plot.

Materials and Methods

The field plot was split in the center to allow for a drive row, resulting in two 200 × 30 ft plots at the ISU Horticulture Research Station, Ames, Iowa. Mechanized treatments were placed on the outer parts of the rows to accommodate row-cover deployment. Treatments included: 1) two-row cover handling methods (manual vs. mechanical deployment and retrieval) replicated twice, and 2) three-row cover treatments replicated four times. The row cover treatments were compared as follows: 1) no row cover (NRC) (4 reps), 2) row covers deployed at transplant and removed at anthesis (RCA), (8 reps), and 3) row covers deployed at transplanting, ends were opened at anthesis and removed 10 days later (RC10) (8 reps).

Due to wet spring conditions, the manual row-cover deployment treatment was planted on June 11 and the mechanical row-cover deployment treatment was planted on June 14. Three- to four-week-old transplants of Athena muskmelons were planted on black plastic with in-row spacing of 24 in. with 6-ft centers. Spunbond polypropylene row covers (Agribon® AG-30) were deployed the same day as transplanting, either manually or mechanically, using the Model 95 three-point tractor attachment (Mechanical Transplanter, Inc.). Row covers were removed manually or with the Hi-Wer System (Frösö Trädgârd AB). No row-cover treatments were drenched with Admire (imidacloprid).

Sandea® and Poast® were sprayed as pre-emergent and post-emergent herbicides, respectively. Bravo WeatherStik, Pristine, and Topsin 4.5FL (fungicides) and Assail and imidacloprid (insecticides) were sprayed when cucumber beetles reached a threshold of one/plant. Weed control was done manually by hoeing, tilling, and mowing between rows.

Populations of spotted and striped cucumber beetles were monitored twice weekly from transplant to the beginning of harvest using visual scouting throughout the plot. Bacterial wilt was monitored every two weeks, and final incidence was noted on September 2. Melons were harvested at full slip every other weekday from August 7 to September 6. Harvest data were taken from a pre-determined 25-ft-long center within each subplot containing 12–13 plants. Weight and number of melons were recorded for each subplot. Culls were assessed based on insect damage, lack of webbing and size, and cracking.

Results and Discussion

Bacterial wilt first was observed one week after anthesis, around August 14. The overwintering cucumber beetles emerged before planting time. Thus, bacterial wilt was the result of feeding by the first field-hatched generation of beetles, which occurred on about August 1. NRC and RCA had higher bacterial wilt (48 and 46%, respectively) than the delayed-removal treatment, which resulted in the least (20%) bacterial wilt incidence (Table 1).

Harvest was earliest for the no-row cover treatment (Table 1). The later planting date (about 4 weeks later than in a normal growing season) reduced the benefits of row covers to protect transplants from severe spring weather.

Although harvest weight did not differ among row cover treatments, large differences in melon number and size were observed. Delayed row cover removal increased the number of fruit by 50 percent, but fruit averaged about a pound (25%) smaller (Figure 1). Late planting also led to heavy insect pressure and several applications of insecticides were required to control feeding on fruit.

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Table 1. Effect of row-cover treatments on mean percent bacterial wilt incidence, mean yield number and weight, and cull number as a percentage of total harvest. Yield data was taken from the center 25 ft of each 100-ft plot.

Trt.	Date of first harvest	Bacterial wilt % plants[4]	Marketable melon size (lb)[4]	Melon number		Melon weight (lb)		Cull as percent of total number	
				Marketable[4]	Total[4]	Marketable[4]	Total[4]	Insect[4]	Size/ webbing[4]
NRC[1]	Aug 9	48 a[e]	3.96 b	19.0 a	29.8 b	75 a	101 a	5.9 a	10.9 b
RCA[2]	Aug 25	46 a	4.61 a	19.6 a	26.3 b	90 a	107 a	1.7 b	13.0 ab
RC10[3]	Sept 1	20 b	3.10 c	31.8 b	44.9 a	98 a	121 a	1.3 b	23.5 a

[1]No row cover with imidacloprid drench at time of transplant.
[2]Row covers at transplant then removed when 50 percent plants have perfect flowers.
[3]Row covers at transplant then end opened when 50 percent plants have perfect flowers and removed 10 days later.
[4]Same letters within column denote no significant difference among row cover treatments.

Figure 1. Delayed row cover removal halved the incidence of bacterial wilt. However, increased numbers of fruit, with small size, were observed.