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Effects of Row Cover Removal Timing in Organic Muskmelon

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Abstract
Muskmelons are difficult to grow using organic practices because of bacterial wilt and the cucumber beetle that vectors the disease. Row covers can be placed over muskmelon transplants and then removed at anthesis (the period at which 50% of plants have female flowers). In addition to shielding muskmelons from bacterial wilt, row covers also can protect plants from 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

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Introduction

Muskmelons are difficult to grow using organic practices because of bacterial wilt and the cucumber beetle that vectors the disease. Row covers can be placed over muskmelon transplants and then removed at anthesis (the period at which 50% of plants have female flowers). In addition to shielding muskmelons from bacterial wilt, row covers also can protect plants from 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 use of simple machinery to assist in the deployment and retrieval of the row covers. This report includes 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. Previous studies indicated a need to control insects after row cover removal. Therefore, we examined the impacts row covers have on insect and disease control and yield on an organically managed large-scale plot.

Materials and Methods

A 200 × 72 ft field plot at the ISU Horticulture Research Station, Ames, Iowa, was managed using organic practices. Three factors were considered: 1) two-row cover handling methods (manual vs. mechanical deployment and retrieval); 2) three-row cover treatments as follows: a) no-row cover (NRC), b) row covers deployed at transplant and removed at anthesis (RCA), and c) row covers deployed at transplanting, ends were opened at anthesis and removed 10 days later (RC10); and 3) an insecticidal transplant application of Entrust (spinosad) and Cidetrak-D (buffalo gourd powder) was applied to half of no-row cover treatments and half of the row-cover treatments immediately after row covers were removed. There were a total of 24 subplots for the three variable combination study (Table 1).

Wet spring conditions delayed planting by about five weeks; the mechanical row-cover deployment treatment was planted on June 20, the manual row-cover deployment treatment was planted on June 21 with 3-week-old transplants of Athena muskmelons. In-row spacing was 2 ft apart in black plastic with 6-ft centers. A band spray of Entrust SC 8 fl oz/acre (spinosad) and Cidetrak-D 3.1 oz/acre (buffalo gourd powder) was applied to half of the NRC treatments. 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); row covers were removed manually or with the Hi-Wer System (Frösö Trädgârd AB, Sweden). Weeds were controlled with 1 ft of chopped corn stover applied to areas between rows.

Cucumber beetles were monitored twice weekly. Surround, Pyganic, and Trilogy (Neem oil) were applied when a threshold average of 1 beetle/plant was observed.

Anthesis occurred July 24 and RC10 row covers were removed August 2. Bacterial wilt was monitored every two weeks, and final incidence was recorded on September 16. Melons were harvested at full slip from August 26 to September 30. Harvest data was taken from a pre-determined 25-ft-long center within each subplot containing 12–13 plants; weight and number were recorded for each plot subplot. Culls were based on insect damage, lack of webbing and size, and cracking.

Results and Discussion

Row-cover treatments reduced bacterial wilt (P=0.0011). Entrust/Cidetrak-D did not affect bacterial wilt (P=0.81) or yield. The NRC treatment had the highest incidence of bacterial wilt (40%), which differed significantly (P<0.05) from the row-covered treatments. RC10 had the lowest bacterial wilt (6%) but did not differ from the RCA treatment (15%). Onset of bacterial wilt was late in the season, one week before harvest, and did not affect yield.

Harvest was about one week earlier for the no-row cover treatments than the row-covered treatments (Table 2). The later planting date minimized the early-season benefits that normally occur with use of row covers. Although harvest weight and number did not differ among row-cover treatments, significant differences (P<0.05) in melon size were observed. The RC10 treatment decreased the size of the fruit by about 1 lb each compared with the NRC treatment. Late planting led to heavy insect pressure and several applications of insecticides were required to control feeding on fruit. Insect culls ranged from 2 to 9 percent of the total fruit number and the earlier harvests had less culls.

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Table 1. Row corn and insecticide treatments used in organically grown muskmelon.

Deployment	Row cover	Transplant insecticide	N[f]
Mechanical[a]	RCA[b]	ECD[e]	2
		None	2
	RCA10[c]	ECD	2
		None	2
Manual	RCA	ECD	2
		None	2
	RCA10	ECD	2
		None	2
None	NRC[d]	ECD	4
		None	4

[a]Row covers were deployed using a Model 95 three-point tractor attachment (Mechanical Transplanter) and removed using a Hi-Wer System (Frösö Trädgârd AB).
[b]Row covers at transplant then removed when 50 percent plants have perfect flowers.
[c]Row covers at transplant then end opened when 50 percent plants have perfect flowers and removed 10 days later.
[d]No row cover.
[e]Entrust/Cidetrak-D sprayed on foliage in 1ft band.
[f]Number of replicates.

Table 2. 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.

					Melon no./plot		Melon wt (lb)/plot		Cull fruit as % of total fruit no.	
Row cover	N[4]	Bacterial wilt (% plants)[5]	Date of first harvest	Marketable melon size (lb)[5]	Marketable[5]	Total[5]	Marketable[5]	Total[5]	Insect[5]	Size/ Webbing[5]
RCA[1]	8	15 a	Sept 6	4.0 b	35 a	45 a	141 a	172 a	6 ab	1.6 ab
RC10[2]	8	6 a	Sept 8	3.6 c	36 a	51 a	131 a	169 a	9 a	3.4 a
NRC[3]	8	40 b	Aug 27	4.5 a	35 a	42 a	164 a	183 a	2 b	1.0 b

[1]Row covers at transplant then removed when 50 percent plants have perfect flowers.
[2]Row covers at transplant then end opened when 50 percent plants have perfect flowers and removed 10 days later.
[3]No-row cover.
[4]Number of replicates.
[5]Same letters within column denote no significant difference among row cover treatments ($P<0.05$).