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A Trap Crop + Insecticide Approach for Cucumber Beetle Management

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Abstract
Spotted and striped cucumber beetles not only cause feeding damage in Iowa cucurbit crops, but vector a bacterium that causes bacterial wilt. 'Turks Turban,' an ornamental gourd, was used alone and in combination with carbaryl as a trap crop for these pests in muskmelon. We hypothesized that the beetles would preferentially feed on highly attractive gourd rows interspersed among the melon crop. Insecticide applications to these rows should be more effective than applications to the entire field and may be sufficient for control in the entire field.

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A Trap Crop + Insecticide Approach for Cucumber Beetle Management

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Introduction

Spotted and striped cucumber beetles not only cause feeding damage in Iowa cucurbit crops, but vector a bacterium that causes bacterial wilt. 'Turks Turban,' an ornamental gourd, was used alone and in combination with carbaryl as a trap crop for these pests in muskmelon. We hypothesized that the beetles would preferentially feed on highly attractive gourd rows interspersed among the melon crop. Insecticide applications to these rows should be more effective than applications to the entire field and may be sufficient for control in the entire field.

Materials and Methods

Three small fields of 'Athena' muskmelon seedlings were established in black plastic mulch at the ISU Horticulture Station near Ames, the Armstrong Research and Demonstration Farm at Lewis, and the Muscatine Island Research Farm in Fruitland. These fields were located at least 1,000 feet from one another. In two of the fields, a row of gourds was established between every five rows of muskmelons. Carbaryl (32 oz/acre) was applied weekly to the rows of gourds in one field. As a control, only muskmelons were planted in the third field.

Striped and spotted beetle populations on five plants/plot were recorded each week. Bacterial wilt ratings (number of wilted plants/plot) were taken at the first sign of disease at each location. Melons were counted, weighed, and inspected for disease and insect damage at harvest.

Results and Discussion

Overall, more striped and spotted beetles visited fields with 'Turk's Turban' than fields with just melons ($P<0.05$). This means that our trap crop makes a melon field a regional attractant to beetles. However, having more beetles in a trap cropped field is only a problem if they move from gourd plants to melon plants. We found that there were more striped beetles in gourd rows than in melon rows throughout the season, but there were the same number of beetles on melon rows in the trap crop and control fields. Furthermore, melon rows more distant from the gourd rows had no fewer beetles in them than rows right next to gourd rows. The trap crop attracts more beetles to the field, but doesn't thoroughly distract them from the melon plants. Consequently, there was the same average number of wilted plants in melon rows from fields with and without the trap crop (Table 1).

We hoped to slow the dispersal of beetles from gourd plants to melon plants by making weekly sprays of carbaryl in the trap crop in one field. These sprays did not reduce the average number of beetles or wilted plants in melon rows when compared with unsprayed rows. It seems, from average beetle counts and wilt ratings, that a 'Turk's Turban' trap crop, sprayed or unsprayed, does not decrease the incidence of bacterial wilt in muskmelon.

Yield data from these three fields, however, show that the field without a trap crop and the carbaryl-treated trap crop field produced a greater number and total weight of melons than did the unsprayed trap crop field. Our average beetle counts and wilt data do not reflect this trend, so we tracked beetle populations and bacterial wilt development over time for each field. For the first two rating dates with wilt signs (fourth and fifth), the unsprayed trap crop

field had significantly more bacterial wilt incidence than the control or sprayed trap crop plots ($P<0.05$). Perhaps this early infection had a greater impact on yield.

Oddly, there was no correlation between bacterial wilt development and beetle population dynamics this season ($P<0.05$). This may have occurred because beetle populations were very low, a phenomenon that may also have masked the impact of our treatments. We did note that the population of striped beetles on melon plants in the trap crop fields seemed to increase sharply when most of the trap crop wilted (about the seventh and eight rating date). This shows that to effectively use this trap crop, we will need to keep it alive for the entire season.

We will repeat this experiment next season with different beetle populations. One potential improvement may be the use of a highly effective systemic imidacloprid insecticide with the gourd trap plants. This may keep the gourds alive for the entire season. It may also be more toxic to visiting beetles, preventing them from moving to a melon plant after feeding on squash plants.

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Table 1. Mean striped and spotted beetle counts, incidence of bacterial wilt, and yield in melon and squash rows of fields with no trap crop, an unsprayed trap crop, and a carbaryl-treated trap crop.

	Striped beetles[1]	Spotted beetles	Wilted plants[2]	Number of melons[3]	Weight of melons
No trap crop (M[4])	0.07 a	0.62	0.25 a	20.7 a	119.3 a
Unsprayed trap crop (M)	0.16 ab	0.35	0.38 a	8.5 b	46.4 b
Carbaryl trap crop (M)	0.13 a	0.41	0.26 a	17.7 a	97.2 a
Unsprayed trap crop (G)	1.15 c	0.39	2.13 b	-	-
Carbaryl trap crop (G)	0.48 b	0.33	3.08 b	-	-
LSD (P<0.05)	**0.34**	**-**	**0.54**	**6.1**	**34.3**

[1] Mean number of beetles counted on a single plant on single rating date.
[2] Mean number of wilted plants in a single row of 12 plants on a single rating date.
[3] Mean number of melons harvested from a single row of 12 plants.
[4] M=melon row, G=gourd row.