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Melittia cucurbitae (squash vine borer) attraction to zucchini as a trap crop

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Introduction

- Squash vine borer (SVB), *Melittia cucurbitae*, is a key pest of squash. The adult (Figure 1) lays its eggs on stems, and larvae bore into the stem of the plant. Feeding within the stem (Figure 2) can kill the plant.

- Primary hosts are squash and pumpkin. SVB can cause 25% crop loss in commercial squash fields (1).

- In Ohio, squash crops are worth $9.7 million each year and pumpkin crops have a value of $19.2 million. They are also popular garden crops (2).

- Insecticide can be used to control SVB but some growers are seeking non-chemical tactics.

Figure 1: An adult squash vine resting on a leaf. (Photo Mike McFarland)

Figure 2: A squash vine borer larva that has bored into a stem. (Photo by Mike McFarland)

- Row covers could be used to block infestation and promote earlier crops. However, row covers offer only partial protection from SVB because they are removed once the female flowers appear, to allow for pollination.

- Delaying planting is thought to prevent SVB infestation, but this has not been proven. The economic advantages of early vs. late planting are debatable; earlier crops can be sold at a higher price before the main-season oversupply of produce. Presence of an early planting could act as a trap crop for a later planting.

- Unharvested zucchini plants can have significantly higher SVB infestation rates in the stems than zucchini harvested on a regular basis (3). This suggests that unharvested plants might be suitable for a trap crop tactic.

Objective and Hypothesis

- Objective: Evaluate three factors that could contribute to the attractiveness of zucchini as a trap crop. These factors are:
  - Harvested vs. unharvested
  - Early vs. late planting
  - Row cover vs. no row cover

- Hypothesis: Unharvested zucchini can be an effective trap crop, but its effectiveness varies depending on whether it is planted early or if used in conjunction with row covers. Unharvested zucchini should be most effective as a trap crop for late-planted zucchini that is protected by row covers during its pre-flowering growth stages.

Methods

- Experimental design was factorial, with three factors each with two levels, for a total of eight treatments: Harvested vs. unharvested, early vs. late planting and row cover vs. no row cover. There were four replicates of each treatment in randomized complete blocks.

- The trial was conducted three times: at one site in 2015 and at 2 sites in 2016. Each plot was a single row of 5 plants.

- "Spineless Perfection" zucchini.

- Early zucchini was transplanted in mid-May and late zucchini was transplanted in mid-June.

- Zucchini over 6 inches was harvested three times per week.

- Unharvested treatments were not harvested at all.

- Row covers were installed at planting then removed as soon as the first female flower appeared (Figure 3).

- After final harvest, each plant stem was dissected to determine SVB infestation.

- The data was subjected to logistic regression in R studio.

Figure 3: One of the sits after row covers removed from early plots and with row covers in place on the late planted plots. (Photo by Mike McFarland)

Results

- Late plantings had significantly lower infestation rates when compared to early plantings at all three sites (P<0.001) (Figure 4).

- Zucchini plants with row covers had higher infestation rates than without row covers at both sites in 2016 (P=0.0033 and P=0.0032) but not at the 2015 site (P=0.7102) (Figure 5).

- Unharvested plants had significantly higher infestation rates than harvested plants at the north site in 2016 (P=0.0004). The 2015 field also had higher infestation rates in unharvested plots but differences were not significant (P=0.1418) However in the 2016 south field, the harvested plants had a higher infestation rate although it was not significant (P=0.3643) (Figure 6).

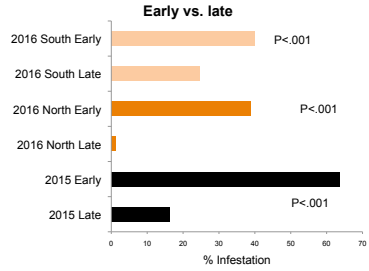

Figure 4: Infestation rates of SVB for early and late plantings of zucchini, with other factors combined. Analysis was separate for each site.

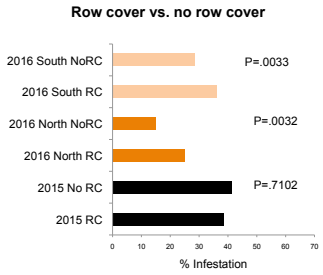

Figure 5: Infestation rates of SVB for zucchini with row covers (RC) and without row covers (NoRC), with other factors combined. Analysis was separate for each site.

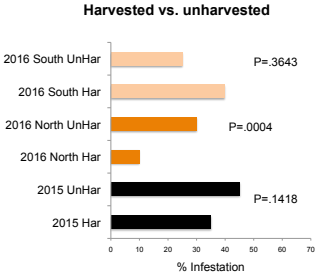

Figure 6: The combined infestation rates of SVB for zucchini plants that were harvested (Har) and unharvested (UnHar), with other factors combined. Analysis was separate for each site.

Conclusions

- SVB infests early-planted crops more readily than late planted crops. This is likely due to the SVB's preference towards thicker stems and larger plants.

- The increase in infestation in row cover plots could be due to the row covers increasing the growth rate of the plant, making the plant larger and more attractive to SVB when the row covers come off; SVB adults were still active when the later row covers were removed.

- Unharvested plants had slightly higher infestation at two of the three sites but the lack of significance makes it a less promising option for trap cropping than delayed planting. However unharvested plants should also be evaluated in the absence of both early and late plants to see if they are more effective when used at a single planting date.

- For a trap crop tactic, these data imply that planting a trap crop early would be the most effective.

References

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