Influence of fruit position, harvest frequency and cane density on *Drosophila* infestation in fall red raspberry

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INTRODUCTION

Vinegar flies (Diptera: Drosophilidae) can be serious pests to fruits, including raspberry. Spotted Wing Drosophila (SWD) is an invasive vinegar fly which poses a particular challenge to raspberry growers because it can infest fruit before it is ripe. Understanding behavior and egg-laying preference of *Drosophila* species can help improve sustainable management techniques.

OBJECTIVES

I. Determine the height at which infestation is highest within a raspberry planting
II. Examine how different levels of floricane pruning effect rates of *Drosophila* infestation
III. Determine the optimum harvest frequency to reduce infestation

METHODS

I. Spatial Distribution

- Raspberries were hung at 1, 4, and 7 ft. from the ground within the interior and exterior of the planting. 10 store bought raspberries were placed in 8 oz. open containers
- After 24 hours, fruit were collected, placed in a salt bath, and the number of Drosophila eggs and larvae were counted.

II. Cane Density

- Raspberries were hung in the plant canopy as described above. This was replicated 3 times across differing floricane densities: zero (low), 30 (medium) or 60 (high).
- Fruit were collected 24 hours later, as described above.

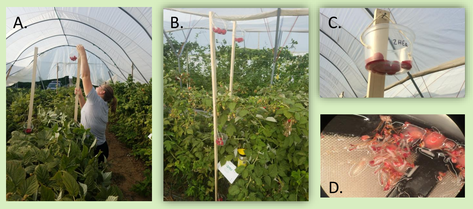

Figure 1.
A. Placing fruit
B . Complete plot with fruit positioned at three canopy heights
C. Example of container with raspberries
D. Microscope view of salt test with larvae present

III. Harvest Frequency

- Twelve 10 meter plots of high tunnel raspberry were harvested either every day, every 2 days or every 3 days. Over 9 days, fruit from each plot were collected and the number of Drosophila eggs and larvae were counted.

I. SPATIAL DISTRIBUTION

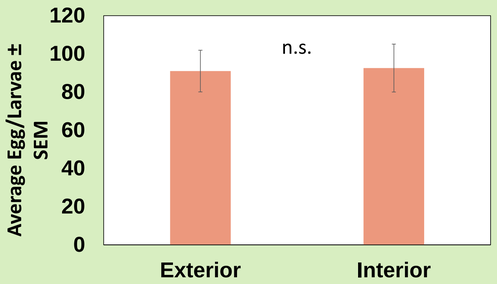

Figure 2. Average ($\pm$SEM) egg and larvae infestation between interior and exterior canopy positions. n.s. = no significance (Tukey's HSD, $\alpha = .05$)

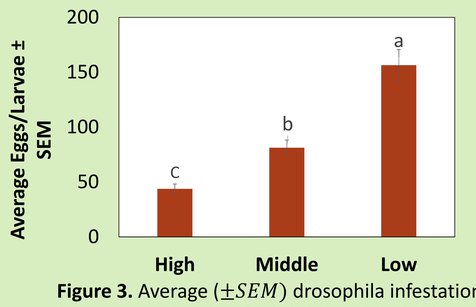

Figure 3. Average ($\pm SEM$) drosophila infestation from various heights, high (7ft), middle (4ft), and low (1ft), within the canopy. Means labeled with different letters are significantly different (Tukey's HSD, $\alpha = .05$)

Infestation was not significantly different whether the fruit were placed on the interior of exterior part of the canopy (Figure 2).

Infestation was significantly higher when fruit were placed low to the ground compared to both the middle and high heights. Levels of infestation significantly decrease with each increase in height (Figure 3).

II. CANE DENSITY

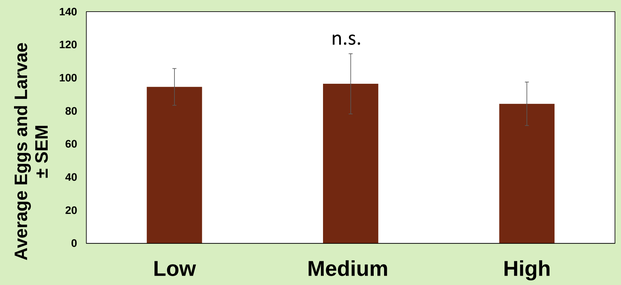

Figure 4. Average ($\pm SEM$) eggs and larvae at low (no canes), medium (30 canes) and high (60 canes) density. n.s = no significance (Tukey's HSD, $\alpha = .05$)

There was no statistical difference of infestation found between any of the pruning treatments (Figure 4).

Plots with high density (60 floricanes) had the lowest infestation, numerically.

III. HARVEST FREQUENCY

Harvesting either every day or every two days significantly reduces the level of infestation compared to harvesting every 3 days (Figure 5).

Third instars, which are visible without magnification, are especially reduced on a shorter harvest schedule.

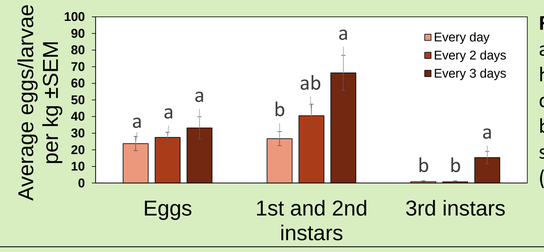

Figure 5. Average eggs and larvae ($\pm SEM$) harvested every 1, 2 or 3 days. Averages followed by different letters are significantly different (Tukey's HSD, $\propto = .05$).

CONCLUSIONS

The highest levels of infestation occur in fruit located closest to the ground regardless of placement within the canopy or cane density. This is likely a more conducive microclimate for *Drosophila* to prevent from desiccation.

A harvest schedule of 2 days or less significantly reduces *Drosophila* infestation of all life stages.

Management practices in raspberry should take care to remove fruit from the ground frequently and harvest at most every two days to prevent yield loss due to *Drosophila* infestation.

Future research should focus on optimizing control strategies for where and when *Drosophila* are most active.

AKNOWLEDGEMENTS

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