CAN NEMATODES AID IN SPOTTED WING DROSOPHILA (*DROSOPHILA SUZUKII*) CONTROL?

Rambika Thapa, Emilie Cole, Jacqueline Perkins, Rufus Isaacs, and Marisol Quintanilla
Michigan State University, Department of Entomology

INTRODUCTION

- The invasive pest, spotted wing *Drosophila* (SWD), since its 2008 US introduction, has shifted IPM practices in small fruit production towards high-intensity calendar sprays.
- There is a need for alternative practices that can reduce SWD pressure without relying on chemical intervention.
- Entomopathogenic nematodes (EPNs) inhabit the soil and contain bacteria that once entered into an insect host, cause mortality
- During the SWD life cycle, 3rd instar larvae drop from fruit to the soil to pupae
- Previous work has shown that there is potential for EPNs to control SWD, hence our objectives were to:

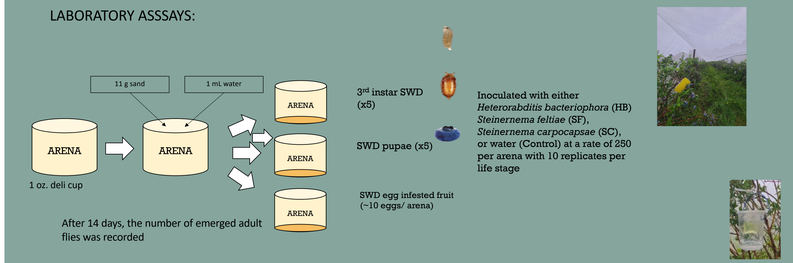
1: Under laboratory conditions determine how 3 EPN species influenced SWD adult survivorship with exposure to larvae, pupae, and eggs

2. Determine the impact of EPN applications under field conditions

WILL EXPOSING DIFFERENT LIFE STAGES OF SWD TO *S. FELTIAE*, *S. CARPOCAPSAE* OR *H.BACTERIOPHORA* RESULT IN LOWER ADULT FLY EMERGENCE?

METHODS

LABORATORY ASSSAYS:

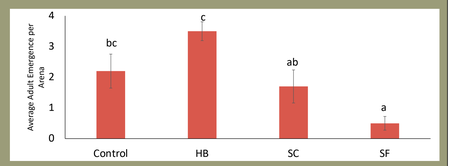


FIELD ASSSAYS:

- Field Assays were established in June 2021 in Southwest Michigan
- *S. feltiae* and *H. bacteriophora* and an untreated control with four replicates were tested. Each replicate consisted of 7 bushes, separated by 5 bushes as barriers.
- EPNs were applied according to label instructions bi-weekly for 4 weeks.
- SWD traps and fruit were collected weekly for 6 weeks to monitor SWD pressure.

RESULTS: LABORATORY

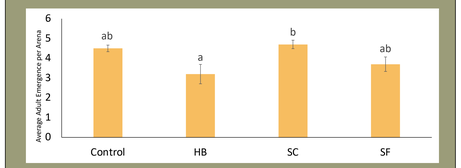
PUPAE



- *Steinernema feltiae* (SF) treated pupae had significantly less adult emergence compared to the Control (p= 0.047) and *Heterorabditis bacteriophora* (HB)(p< .001) treated pupae (Tukey HSD, α=.05)

SWD pupae (above) and 3RD instar larvae (below) in within assay arenas prior to EPN application

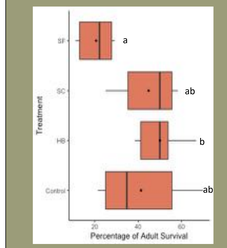
3rd INSTAR LARVAE



- The application of EPNs did not significantly reduce survivorship compared to the control.
- However, fewer *H. bacteriophora* (HB) treated 3rd instar larvae survived to adulthood compared to *S. carpocapsae* (SC) (p=0.016) treated larvae.

SWD infested blueberry, with egg respiratory filaments visible.

INFESTED FRUITS

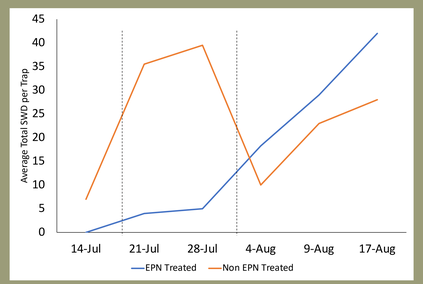


- Average adult fly emergence following EPN exposure was significantly reduced *in S. feltiae* (SF) treated arenas compared to *H. bacteriophora* (HB) treated arenas (p= 0.0384)

- No treatment significantly differed from the control

Infected fruit treated with EPNS

RESULTS: FIELD



Average total adult SWD captured in lure traps in EPN and non EPN treated areas. Dashed lines indicate time points when EPNS were applied.

- SWD counts were grouped between EPN treated areas and non-EPN treated areas.
- Early in the season, EPN had lower SWD populations compared to the non-EPN treated areas, but after 4 weeks the trend flipped.
- In early summer 2022, emergence cages will be established to determine direct effects of EPN application on SWD population establishment.

Blueberry field site (above), SWD lure trap (below)

Drosophila larvae in a coffee filter

CONCLUSIONS

1. *Steinernema feltiae* (SF) significantly reduced adult SWD emergence at the pupal and infested fruit life stage, while *Heterorabditis bacteriophora* (HB) was most effective at reducing adult survivorship when exposed to the 3rd instar life stage.

2. Individual species effects are unclear under field conditions currently, however, in the coming field season we hope to determine if the predominantly effective EPN under laboratory conditions are also effective in a field setting. We will also determine if the use of EPNs is an economically viable option for growers.

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