SARE/NCAT Our Farms, Our Future Conference

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Enhancing Natural Enemy Systems: Biocontrol Implementation for Peachtree Borers

Introduction

Orchard crops are attacked by a complex of wood-boring insects. Of particular concern for stone fruits in the Southeastern US are the peachtree borer (PTB), *Synanthedon exitiosa*, and the lesser peachtree borer (LPTB), *Synanthedon pictipes*. LPTB is an aboveground pest (Fig. 1) boring into the tree's trunk and limbs, whereas PTB is a root pest (Fig. 2). These pests are controlled with broad spectrum chemical insecticides. The continual use of these chemicals can have a profound negative impact on the complex of beneficial natural enemies in cropping systems. Clearly, effective alternative pest management strategies are needed. Our initial research indicated substantial promise for a sustainable biocontrol solution, i.e., the use of beneficial entomopathogenic (insect-killing) nematodes (EPNs). The nematode, *Steinernema carpocapsae*, is particularly virulent to LPTB and PTB. EPNs are safe biopesticides used to control a variety of insect pests (Hajek & Shapiro-Ilan 2018).

Our overall goal was to tackle the primary remaining challenges to implementing EPNs as a biocontrol tactic for borer pests, and to assess the broader impact of this biocontrol strategy on the system. Specifically, our objectives are to I) Determine the optimum method of applying entomopathogenic nematodes for control of PTB, II) Determine the optimum entomopathogenic nematode formulation for control of LPTB, and III) Assess the impact of biocontrol applications on natural enemy populations.

Fig. 1. Lesser peachtree borer and damage it causes aboveground

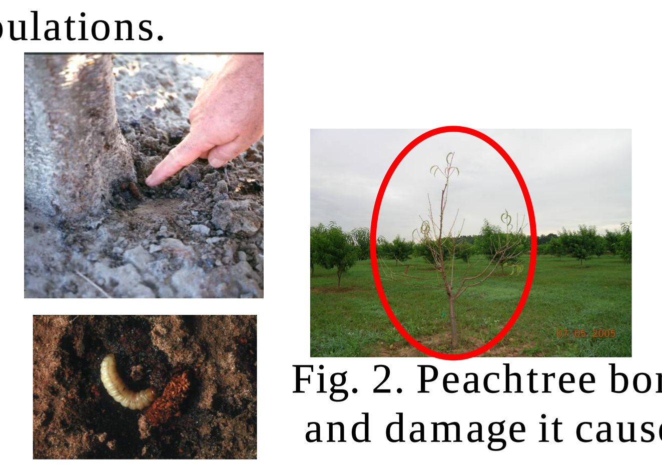

Fig. 2. Peachtree borer and damage it causes

Methods

Replicated field tests in peach were conducted to compare the efficacy of beneficial nematodes (*S. carpocapsae*) to standard chemical treatment (chlorpyrifos).

For lesser peachtree borer: Experiments were conducted to determine if a protective gel (a firegel, Barricade®), would protect the nematodes from UV radiation and desiccation and facilitate high levels of control. Nematodes were applied to lptb infested wounds.

For peachtree borer: Experiments were conducted to determine if the type of spray equipment affects efficacy in preventative (summer/fall) or curative (spring) applications, and if the firegel could also be used in lieu of irrigation to prevent desiccation of nematodes in soil.

Results

For lesser peachtree borer: Nematodes (Sc) + Barricade at full and 2% rates provided control equal to chlorpyrifos (Fig. 3); similar results observed when the experiment was repeated in a consecutive year (data not shown) (Shapiro-Ilan et al. 2016a).

For peachtree borer:

- In preventative applications (summer/fall), nematodes (Sc) caused equal levels of control compared with chlorpyrifos regardless of application equipment (Fig. 4) (Shapiro-Ilan et al., 2015).
- In curative (spring) applications, nematodes (Sc) provided control of PTB whereas chlorpyrifos did not (Fig 5); similar results were observed when the experiment was repeated (data not shown) (Shapiro-Ilan et al, 2016b).

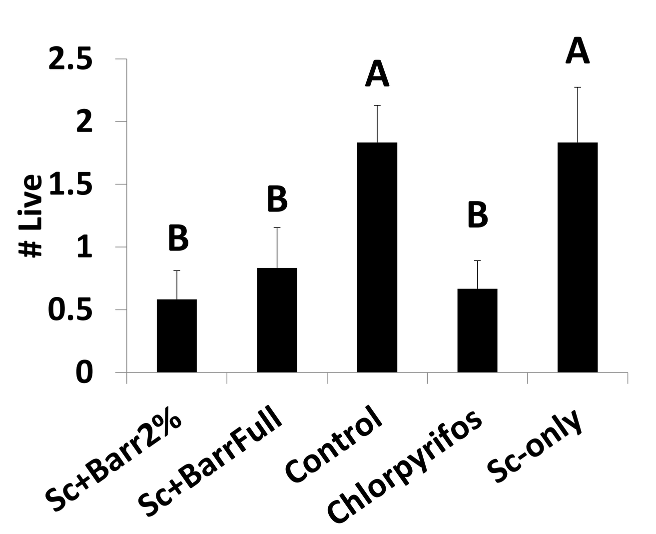

Fig. 3. Number of live lesser peachtree borer per wound following applications of Sc nematodes (*S. carpocapsae*) with 2% Barricade gel, full rate of gel, untreated control, chlorpyrifos, or nematodes without gel (Sc-only).

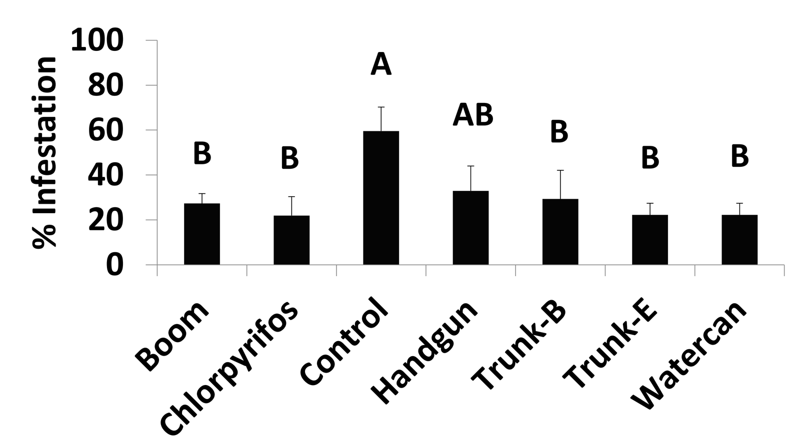

Fig. 4. Percentage infestation of peachtree borer following preventative applications of beneficial nematodes (*S. carpocapsae*) with various spray equipment (boom sprayer, handgun, trunk sprayer, or watering can). A positive control (chlorpyrifos) and negative (non-treated) controls was included.

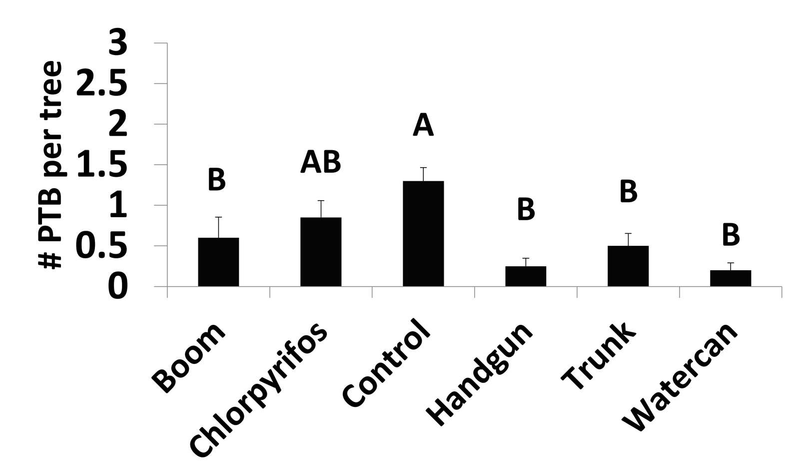

Fig. 5. Number of peachtree borer larvae per tree following curative applications of beneficial nematodes (*S. carpocapsae*) with various spray equipment (boom sprayer, handgun, trunk sprayer, or watering can). A positive control (chlorpyrifos) and negative (non-treated) controls was included.

Conclusions

Lesser peachtree borer:

❖Barricade gel can enhance nematode efficacy and persistence aboveground in a single spray!
❖Control levels are similar to chemical standards (chlorpyrifos).
❖The formulation can be enhanced further with adjuvants (sunscreens).

Peachtree borer:

❖In summer and fall applications: *S. carpocapsae* suppresses PTB, equal to the chemical standard (chlorpyrifos).
❖In spring applications (curative): *S. carpocapsae* suppressed PTB but chlorpyrifos did not.
❖A variety of standard equipment methods can be used (trunk sprayer, boom sprayer, handgun).
❖Barricade could replace the need for irrigation in treated areas.
❖Cost analysis & optimization: current projections nematodes maybe approx. $15 per acre.

Future Directions

When applying nematodes for peachtree borer control, what additional benefits might be expected in orchard systems? We will explore the potential for these applications to also 1) control harmful plant parasitic nematodes (the good nematodes suppressing the bad nematodes), 2) control other root-feeding insects, 3) control harmful root diseases such as Armillaria. These novel objectives will be investigated under a new S-SARE-funded project (LS18-298).

Collaborations

Co-investigators: Ted Cottrell, Bob Behle, Chris Dunlop (USDA-ARS); Dan Horton, Greg Colson, Dario Chavez (University of Georgia), Russ Mizell (University of Florida).
Grower Cooperators: Georgia Peach Council, Lane's Southern Orchards.
Technical Assistance: Stacy Byrd, Merry Bacon, Kathy Halat.

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