Purdue University
Department of Entomology
Undergraduate Capstone
Project Summary

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Project Title:

Infectivity of Indiana Lawn-Based Strains of the Nematode *Heterorhabditis bacteriophora* in 3rd Instar Larvae of the Southern Masked Chafer *Cyclocephala lurida*

Project Summary:
The Southern Masked Chafer is an economically important annual white grub species that commonly infests turfgrass. After adult flight and oviposition, which takes place in June and July, three subsequent larval instars feed in the soil damaging the roots of the turfgrass. Secondary damage to turfgrass caused by animals digging in the soil for the white grubs is also a serious concern for turfgrass managers. To manage annual white grubs, one of three traditional approaches is commonly used. The first approach is preventive, and typically involves the use of extended residual chemical insecticides applied to areas with a history of repeated white grub infestation. Such treatments are made prior to the occurrence of white grubs, and are used as insurance to protect against possible white grub infestations in the near future. The second approach is reactive approach targeting an existing infestation of early instar white grubs. This approach is often used in conjunction with monitoring in order to control white grubs before damage is evident. It is during this time that insect parasitic nematodes are most effective. The third approach is the rescue approach aimed at controlling white grubs after damage has become apparent. Although not the most effective approach due to the difficulty associated with controlling large, 3rd instar white grubs, the curative approach is common among homeowners who are unaware that their lawns are infested until obvious damage has occurred. Rescue applications are made in hopes of stopping further damage from occurring. Enhancing the efficacy of nematodes against third instar white grubs by identifying strains with better late-season activity could provide homeowners with a safer white grub management alternative. The objective of this study was to determine if local, lawn adapted strains of *Heterorhabditis bacteriophora* have better potential for use as a rescue treatment against *Cyclocephala lurida* than the common commercially available strain. I hypothesized that lawn-adapted strains may provide better curative efficacy than the common commercial strain.

Materials & Methods
The infectivity of three locally collected strains of the nematode *Heterorhabditis bacteriophora* (Hb123,Hb 96, Hb 109) was compared against a common commercial strain (GPS11). For the first two trials soil cups were filled with organic top soil and four Southern Masked Chafer larvae were allowed to establish themselves in soil. Nematodes were then added to each cup at a rate of 2.4 (trial 1) or 4.8 (trial 2) billion/ha. Each nematode strain was replicated four times in each trial. Then, after one week the grubs were checked for nematode-induced mortality based on color change.

In the third trial, sand was placed in twenty-four well plates with one grub per well and five nematodes per well. Each nematode strain was replicated four times in each of four plates. Nematode induced mortality was recorded after 7 and 14 days.

Results

In the first trial (Fig. 1) only GPS 11, which resulted in ≈35% infection was statistically different from the control. It however, was not statistically different from two of the lawn based strains (Hb123, Hb96). For the second trial (Fig. 2) two of the lawn based strains (Hb123, Hb109) resulted in the highest infection rates, however, none of the treatments were statistically different from the control. Trial number three (Fig. 3) resulted in infection rates that dramatically increased after the first week. However, due to the high amount of within treatment variability, none of the treatments showed infection rates that were statistically different from the control.

Conclusion

Trials demonstrate that *Heterorhabditis bacteriophora* is capable of causing up to 50% mortality in 3rd instar larva of the Southern Masked Chafer under laboratory conditions. However, the results were highly variable and no one strain consistently out preformed another. The lawn-adapted strains did not appear to provide any better rescue efficacy than the commercial strain.

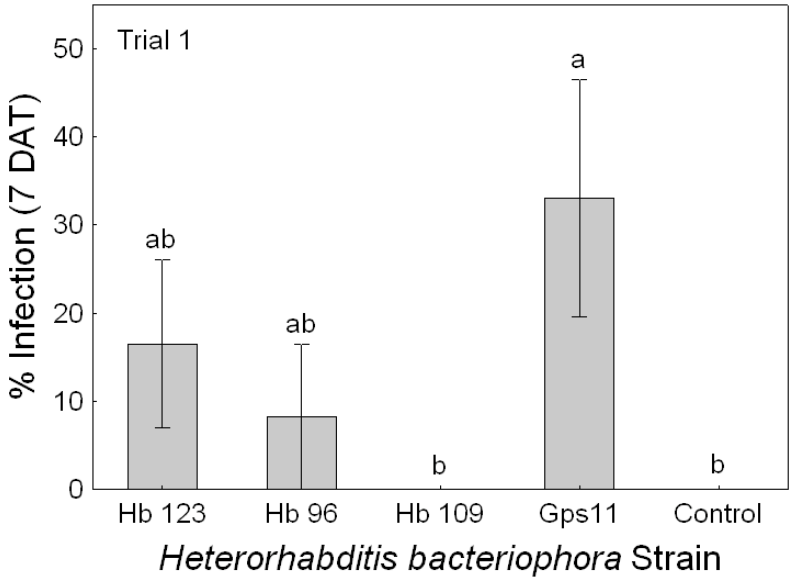

Figure 1. Infectivity of three lawn adapted strains (Hb123,Hb96, Hb109) and one commercial strain (GPS11) in the 3rd instar of the Southern Masked Chafer, *Cyclocephala lurida* in cups of soil in the laboratory. Infectivity recorded after 7 days. (trial 1)

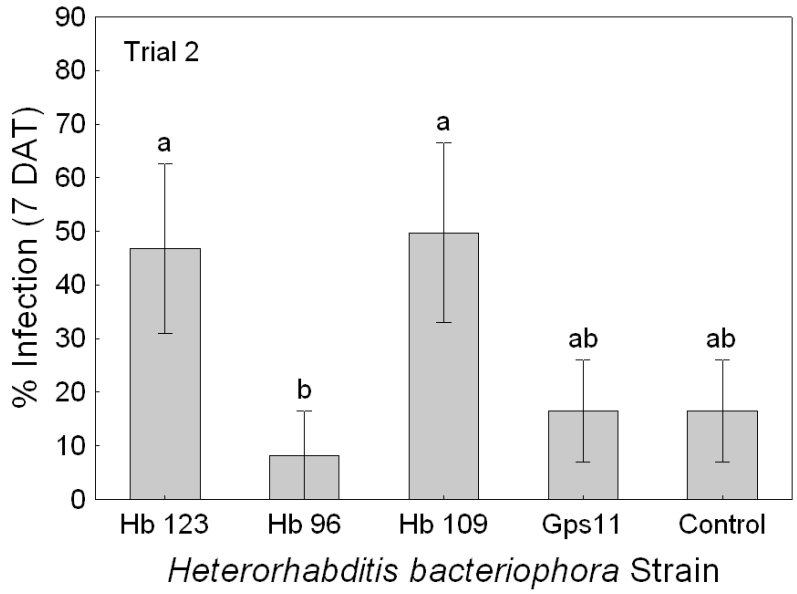

Figure 2. Infectivity of three lawn adapted strains (Hb123,Hb96, Hb109) and one commercial strain (GPS11) in the 3rd instar of the Southern Masked Chafer, *Cyclocephala lurida* in cups of soil in the laboratory. Infectivity recorded after 7 days.

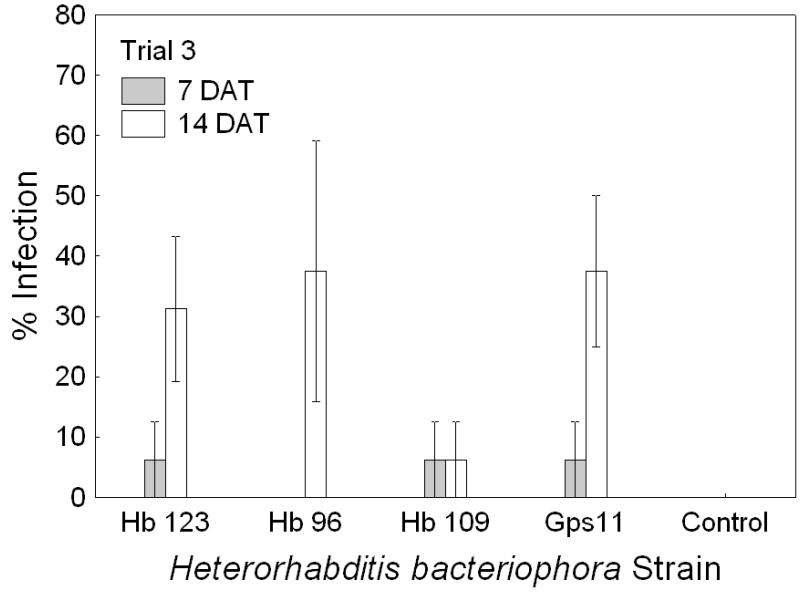

Figure 3. Infectivity of three lawn-adapted strains (Hb123,Hb96, Hb109) and one commercial strain (GPS11) in the 3rd instar larvae of the Southern Masked Chafer, *Cyclocephala lurida*, in 24-well plates of sand in the laboratory. Infectivity recorded after 7 and 14 days.