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Laboratory Evaluation of Efficacy of Entomopathogenic Nematodes on Texas Leaf-cutting Ants, *Atta texana*

Pushpa Soti¹, Quentin Van Camp², and Alexis Racelis¹

Abstract. Entomopathogenic nematodes, a large group of nematodes specialized for parasitism of insects, have been used as classical biological control agents. The nematodes have potential to be used for insect pest management in organic gardening. We studied the potential impact of two entomopathogenic nematodes *Steinernema carpocapsae* Weiser and *Heterohabditis bacteriophora* Poinar on the Texas leaf-cutting ant, *Atta texana* Buckley, that is considered a problematic agricultural pest in the southern US. We used a relatively large exposure rate of 250,000 nematodes per 10 ants in Petri dishes and monitored ant activity during a 96-hour time period. Results showed no significant differences among the two nematodes and check in numbers of ants killed after 12, 24, 48, 72, or even 96 hours of exposure.

Introduction

The Texas leaf-cutting ant, *Atta texana* (Buckley), is considered a problematic agricultural pest in the southern US (Schowalter and Ring 2017). The ants have been reported to defoliate significant amounts of crop biomass in short periods of time. Leaf-cutting ants can attack plants at any developmental stage, cutting leaves, flowers, buds, and thin branches that are transported to the nest and used as substrate for growth of symbiotic fungus (Garcia et al. 2003, Moreira et al. 2004) to feed the ant colony. The ants create below-ground nests with several complex chambers that can reach 4 to 6 meters deep, interconnected by narrow tunnels, which makes control difficult. While some formulations of contact insecticides are available for temporary control, leaf-cutting ants eat only fungus they cultivate and do not respond to common ant control methods, thus making control difficult. This problem is even worse on organic farms where farmers have limited options for effective pest management.

Entomopathogenic nematodes, a large group of nematodes specialized for parasitism of insects, have been used as classical biological control agents to manage a variety of economically important pests (Grewal et al. 2005, Shapiro-Ilan et al. 2006, Kapranas et al. 2017). Nematodes have potential to be used for pest management in organic farming. In this study, we studied the potential impact of two entomopathogenic nematodes *Steinernema carpocapsae* Weiser and *Heterohabditis bacteriophora* Poinar on Texas leaf-cutting ants.

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Materials and Methods

In May 2017, ants were collected from three ant nests at Edinburg, TX: 1) on-campus nest at the University of Texas Rio Grande Valley, 2) organic vegetable farm, and 3) lawn at a private property. The ants were kept in a refrigerator for 1 hour to slow them for easy handling.

Infective juveniles of *Steinerneima carpocapsae* and *Heterohabditis bacteriophora* nematodes were purchased from Arbico Organics, Oro Valley, AZ. The nematodes were stored in a refrigerator as recommended until use.

The nematodes were suspended with 500 ml of deionized water. A 20-ml quantity of the nematode suspension (very large number of 25,000 nematodes in deionized water) was put into to 5-cm diameter Petri dishes lined with Whatman No. 1 filter paper for each of the nematodes. For the check, only deionized water was added to the Petri dish. Ten ants were added to each Petri dish with the nematodes. All three treatments, *Steinerneima carpocapsae*, *Heterohabditis bacteriophora*, and check were replicated 10 times. The Petri dishes were placed in a dark place at room temperature, and ant activity was monitored after 12, 24, 48, 72, and 96 hours.

Results and Discussion

Results from our study in laboratory conditions indicated that during 96 hours of observation, the nematodes did not kill a significant number of ants even with an exceptionally large number of nematodes. Slightly more ants were killed by *Heterohabditis*, but it was not statistically significant (Fig. 1).

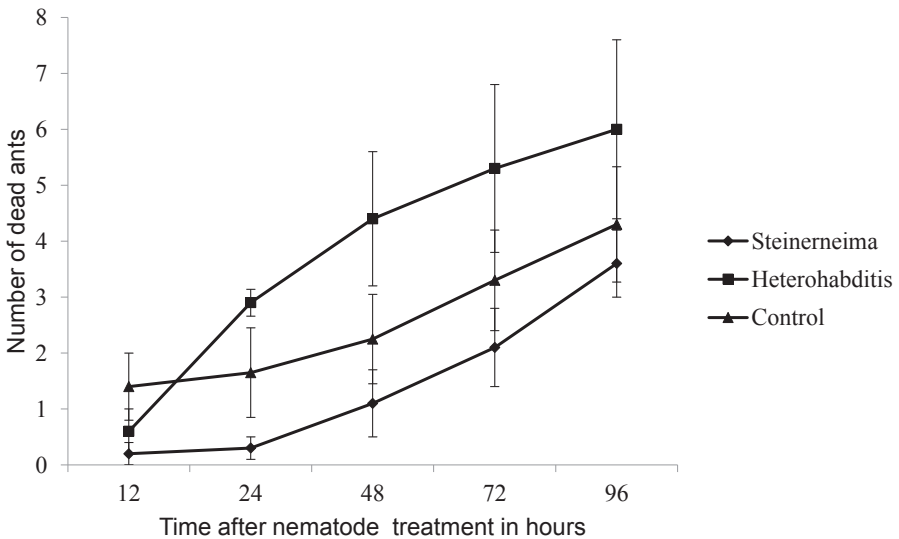


Fig. 1. Number of Texas leaf-cutting ants, *Atta texana* that died over time after treatment with entomopathogenic *Heterohabditis* and *Steinerneima* nematodes.

Entomopathogenic nematodes have been reported to have a broad host range (Hazir et al. 2004, Georgis et al. 2006), and their efficacy is enhanced by matching the most appropriate species to the target pest (Gaugler 1999). This study was a first attempt to test potential use of entomopathogenic nematodes as biological control agents for leaf-cutting ants. Our results showed that entomopathogenic nematodes were ineffective in controlling leaf-cutting ants.

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