Efficacy of Entomopathogenic Nematodes For Control of European Crane Fly (*Tipula paludosa)* Larvae in Creeping Bentgrass Fairway Turf When Applied in the Spring

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Objectives

The objective of the project was to determine efficacy of various entomopahtogenic nematode species (*Steinernema feltiae, Steinernema carpocapsae, Heterorhabditis bacteriophora)* and different rates for the control of early instar European crane fly (*Tipula paludosa*) larvae (leatherjackets) on creeping bentgrass fairway turfgrass applied in the spring.

Experimental Design/ Methods

This experiment was conducted on plots of "Cobra" creeping bentgrass (*Agrostis stolonifera*) on the soil rootzone landing area of the alternative construction putting green at the Guelph Turfgrass Institute. This turf is maintained as a golf course fairway (11 mm mowing height, irrigation to prevent stress, 2-3 kg actual N 100 m^{-2} yr^{-1}).

Experimental Design and Plot size:
The experimental plots were in a randomized complete block design with 6 replications of each treatment. Plots were 1 m x 2 m (2 m^2) (Figure 1). Treatments were as indicated in Table 1.

Table 1. Treatments

Treatment 1	Control (water + adjuvant)
Treatment 2	Standard Pesticide (carbaryl at 2 mL m^{-2})
Treatment 3	Adjuvant+ Nemasys (*Steinernema feltiae*, *Sf*) applied at 500,000 m^{-2} applied twice, one week apart
Treatment 4	Adjuvant+ Nemasys (*Steinernema feltiae*, *Sf*) applied at 1,000,000 m^{-2}
Treatment 5	Adjuvant+ Millenium (*Steinernema carpocapsae* , *Sc*) applied at 1,000,000 m^{-2}
Treatment 6	Adjuvant + Natural Insect Control *(Heterorhabditis bacteriophora, Hb*) nematodes applied at 1,000,000 m^{-2}
Treatment 7	Adjuvant + Natural Insect Control (*Steinernema carpocapsae, Sc* and *Steinernema feltiae, Sf)* nematodes applied at 1,000,000 m^{-2}

Figure 1. Trial layout at the Guelph Turfgrass Institute

Application of the Treatments:
All treatments were applied on 4th instar stage of the crane fly larvae (May 21, 2009). The total water volume for all treatments was 100 L 100 m^{-2} (100 mL m^{-2}) to ensure delivery to the pest location. All treatments were applied at dusk and watered in with 4 mm of water immediately post-treatment.

Efficacy Assessments:
Larvae were recovered by direct harvest from 5 cup-cutter cores (0.1 m diameter x 0.05 m depth) removed in a random pattern from each plot before treatments on May 4, 2009. Post-treatment counts were done using 10 cup-cutter cores (0.1 m diameter x 0.05 m depth on June 14, 2009 (24 DAT), June 25, 2009 (35 DAT), July 13, 2009 (50 DAT). Population densities were reported as larvae per cup changer core and per m^{-2}.

Results

Efficacy assessments:
There was no insect damage to the turf detected at any time prior to or after treatment application.

Plots were assessed at 1 and 7 days after treatment for phytotoxicity effects of the insecticide treatment. None were detected.

Table 2. Post-treatment larval counts

Treatment	Post-treatment (May 9, 2007)	
	Larvae/ core	Larvae m^{-2}

Untreated control	4.667a[1]	594.20a
Lamba-cyhalothrin - .037 mL m^{-2}	3.708ab	472.10ab
Lambda-cyhalothrin - .075 mL m^{-2}	3.042bc	387.31bc
Lambda-cyhalothrin – 0.15 mL m^{-2}	1.958d	249.29d
carbaryl	2.375cd	302.38cd
Lsd p=0.05	1.023	130.25

[1]Mean number of larvae per 5 cores. Lsd values from Fishers' protected LSD tests.

Conclusions

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