

## Efficacy of Biocontrols for the Control of European Crane Fly (*Tipula paludosa*) Larvae in Creeping Bentgrass Fairway Turf When Applied in the Fall

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### Objective

The objective of the project was to determine the efficacy of fall applied bio-controls (*Bacillus thuringiensis kurstaki*; Neu L138I; Neu L161I; and entomopathogenic nematodes (EPN's; which were a 50/50 mixture of *Steinernema feltiae*) and a reduced risk insecticide (chlorantraniliprole) for the control of early instar leatherjackets on a mixed stand of turf maintained as a home lawn.

### Experimental Design / Methods

This experiment was conducted on plots of a mixed stand of turf (Kentucky bluegrass, perennial ryegrass and creeping bentgrass maintained as a home lawn) on the native soil rootzone at the Guelph Turfgrass Institute. The turf was maintained at 7 cm mowing height and fertilized with 2 kg actual N 100 m<sup>-2</sup> yr<sup>-1</sup>.

#### *Experimental Design and Plot size:*

The experimental plots were arranged in a randomized complete block design with 6 replications of each treatment. Plots were 1 m x 2 m (2 m<sup>2</sup>). Each block of plots was established separately on areas of turf with previously known infestations of leatherjackets. Treatments were as indicated in Table 1.

**Table 1.** Treatments

Treatment 1	Untreated Control
Treatment 2	chlorantraniliprole at 0.58 g a.i. 100 m <sup>-2</sup>
Treatment 3	<i>Bacillus thuringiensis kurstaki</i> at 2.85 g a.i. 100 m <sup>-2</sup>
Treatment 4	Neu L138I (2.5% solution) 2.5 mL 100 m <sup>-2</sup>
Treatment 5	Neu L161I (2% solution) 2.0 mL 100 m <sup>-2</sup>
Treatment 6	Entomopathogenic nematodes (EPN's) (a 50/50 mixture of <i>Steinernema feltiae</i> and <i>Heterorhabditis bacteriophora</i> ) at 2 million ij (infective juveniles) 100 m <sup>-2</sup>

#### *Application of the Treatments:*

All treatments were applied on 1<sup>st</sup> and 2<sup>nd</sup> instar stages of leatherjackets (Nov. 4, 2011). Treatments 2, 3, 4 and 5 were applied using a compressed air sprayer (20 psi) with Teejet orange flat fan nozzles. Treatment 6 was applied using a 5 litre watering can. The total spray water volume for treatments 2, 3, 4 and 5 was 10 L per 100 m<sup>2</sup> (100 mL/m<sup>2</sup>) and 200 L per 100 m<sup>2</sup> (2000 mL/m<sup>2</sup>) for Treatment 6 to ensure delivery to the pest location. Treatments 2, 3 and 6 were watered in with 250L per 100 m<sup>2</sup> of water post-treatment. Treatments 4 and 5 were not watered in as recommended by the registrant (Neudorff Canada).

### *Efficacy Assessments:*

Larvae were recovered from each plot by direct harvest from 4 cup-cutter cores (0.1 m diameter x 0.05 m depth) removed in a random pattern on Nov. 25, 2011 (3 weeks after treatment [3 WAT]) and on Dec. 16, 2011(6 WAT). Larval counts were determined from the untreated control of each of the six replications. Replicates 2, 5 and 6 had zero larvae per cup changer therefore those replicates were discarded from the experiment. Larval counts were done only on Replicates 1, 3 and 4 (3 WAT and 6 WAT). Leatherjackets population densities were reported as larvae per cup changer core and per m<sup>2</sup>.

### **Results**

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 (DAT) for phytotoxicity effects of the insecticide treatments on the turf. None were detected.

There were significant differences among the treatments for larvae counts. Results of the treatments at the 3 WAT and 6 WAT are shown in Table 2.

**Table 2.** Post-treatment larval counts taken on two dates in 2011

Treatment Number	Treatment	3 WAT (Nov. 25, 2011)		6 WAT (Dec. 16, 2011)	
		Larvae/core <sup>1</sup>	Larvae/m <sup>2</sup>	Larvae/core	Larvae/m <sup>2</sup>
1	Control	7.25 <sup>2</sup> a	837.73a	5.25a	606.64a
2	chlorantraniliprole	4.42ab	510.38ab	3.42ab	394.80ab
3	Neu L161I	4.42ab	510.38ab	1.58b	182.95b
4	<i>Bacillus thuringiensis kurstaki</i>	3.25b	375.54b	3.08ab	356.24ab
5	EPN's	3.08b	356.24b	2.58b	298.50b
6	Neu L138I	2.75b	317.76b	3.08ab	356.24ab

<sup>1</sup>Mean number of larvae per 4 cores. <sup>2</sup>Mean values from Fishers' protected LSD tests. Means with the same letters are not significantly different.

### **Conclusions**

At 3 WAT, *Bacillus thuringiensis kurstaki*, EPN's and Neu L138I were effective in reducing the populations of first and second instar leatherjackets larvae compared to the untreated control. The level of control amongst those three treatments did not differ significantly from each other (ranging from ~ 55, 57.5 and 62% of the control respectively).

At 6 WAT, only the EPN's and Neu L161I were effective in reducing the populations of first and second instar leatherjackets larvae compared to the untreated control. The level of control between those two treatments did not differ significantly from each other (ranging from ~ 50 and 70% of the control respectively).

None of the experimental bio-control products resulted in phytotoxicity to the turf at 1 or 7 DAT.

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