

Efficacy evaluation of corn gluten/neem cake formulations for the preventative control of European chafer (*Rhizotrogus majalis*) larvae in turf

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The objective of the project will be to determine efficacy of the sponsor's corn gluten/neem cake formulation(s) for the control of sub-surface European chafer (*Rhizotrogus majalis*) larvae in turf .

Target Endpoint Evaluations:

- Pre- and post-treatment larval population densities of European chafer larvae
- % visual injury of turfgrass from pest feeding
- Turfgrass tolerance to corn gluten/neem cake formulations.

MATERIALS/METHODS

This experiment was conducted on plots of predominantly Kentucky bluegrass sod production turf on the soil rootzone field under production in Tottenham, Ontario (Figure 1). Field site was selected based on a history of grub infestation and visible signs of a current infestation, as well as test sampling for grub presence.

Experimental Design and Plot size: The experimental plots were arranged in a randomized complete block design with 6 replications of each treatment. Plot size was 1 m x 2 m. Treatments were as determined with the sponsor, including 3 rates of corn gluten/neem cake formulation and a registered standard control (imidacloprid), as well as an untreated check (Table 1). All treatments were applied at the first instar stage. This would normally be mid-July, but due to the delay in the cold, wet summer, treatments were applied August 25, 2009. All treatments were granular, and were hand applied with a shaker. Irrigation of 10 mm was applied immediately after application to ensure the product moves to the target site (Figure 2). Mowing was excluded for 24 hours after application.

Efficacy Assessments: Insect damage was evaluated visually 7 and 23 days after treatment application (as percentage of plot area affected).



Figure 1. Plot area on sod production field, Tottenham, Ontario, at pre-treatment grub count. Grub damage to turf is visible.



Figure 2. Application of granular insecticide and irrigation, August 25, 2009. Inset shows granular corn gluten/neem at 2x rate.

Plots were surveyed for larval population densities prior to application at the beginning of the experiment (August 21, 2005), and one month after application (October 1, 2005). Larvae were recovered by direct harvest from below a 0.3 m² strip of sod (30 cm wide x 1 m long) cut from half of each plot (Figure 3). Sod was replaced following grub collection. Population densities are reported as larvae m⁻².

Crop Tolerance Assessments: Phytotoxicity of treatments was evaluated as % foliar damage, compared to the untreated check, caused by experimental and the standard treatments. This visual rating was conducted 7 days after the

Table 1. Treatment List

TRT 1	Neem cake product applied at ½x label rate: 2.5 kg 100 m ⁻²
TRT 2	Neem cake product applied at label rate: 5.0 kg 100 m ⁻²
TRT 3	Neem cake product applied at 2x label rate: 10 kg 100 m ⁻²
TRT 4	Standard treatment – imidacloprid (Merit) at 2.8 grams a.i. 100 m ⁻²
TRT 5	Untreated control

application, and was accompanied with instrumental assessment using canopy reflectance methods (normalized-difference vegetation index).

Statistical Design: Treatments were replicated 6 times. The statistical analysis included ANOVA and means separation.

RESULTS

There was patchy grub injury visible across the trial area before treatments began. No visible change in grub injury was noted during the trial.

Pre-treatment larval population density: There was a heavy infestation of larvae uniformly distributed across the experimental area as indicated by the pre-treatment population densities (Table 2), with an average of about 90 larvae per m², which is above the threshold for treatment. Larvae were all quite small, even at the relatively late date in the season, indicating that the timing for application of imidacloprid was appropriate.

Efficacy assessment: The standard insecticide treatment (imidacloprid) gave reasonable (80%) control of chafer larvae. The



Figure 3. Pre- and post-treatment assessment of larval population density: 0.3 x 1 m strip of cut sod removed and replaced. Inset shows early instar larvae at pre-treatment count.

Table 2. Larval population densities, pre- and post-treatment.

Treatment	pre-treatment	28 DAT
Merit (granular)	78.1 ¹	15.0 b
Neem cake @ 0.5 x	97.2	109.4 a
Neem cake @ 1x	96.4	133.3 a
Neem cake @ 2x	101.4	126.7 a
Untreated control	80.0	88.9 a
lsd p=0.05	NS	48.7

¹ Mean of counts of 6 replicates, grubs counted in 0.3 m² strip. Means within columns followed by the same letter are not significantly different (Fishers protected LSD, p=0.05).

experimental treatments did not provide control at any of the three rates (Table 2).

Crop tolerance: There was no visible damage from any of the treatments to the turf 7 days after application. Canopy reflectance measurements confirmed this; in fact, the turf treated with the corn gluten/neem cake products showed a very slight rate-related improvement in turf quality compared to the control (Table 3)

Table 3. Canopy reflectance (normalized-difference vegetation index) of treated turf one week after treatment application.

Treatment	NDVI
Merit (granular)	0.426 c ¹
Neem cake @ 0.5 x	0.433 bc
Neem cake @ 1x	0.465 a
Neem cake @ 2x	0.465 a
Untreated control	0.442 b
lsd p=0.05	0.0131

¹ Mean of 80 readings x 6 replicates, Greenseeker NDVI meter. Means within columns followed by the same letter are not significantly different (Fishers protected LSD, p=0.05).

DISCUSSION AND CONCLUSIONS

There was no evidence of any control of European chafer larvae by the three rates of corn gluten/neem product as applied at early instar level.

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