Efficacy evaluation of various alternative products for the preventative control of European chafer (*Rhizotrogus majalis*) larvae in turf

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Objectives

The objective of the project was to determine efficacy of two formulations of *Bacillus thuringiensis* products applied at two rates in late summer for the control of sub-surface European chafer (*Rhizotrogus majalis*) larvae in turf .

Experimental Design / Methods

This experiment was conducted on plots of two year old turf comprised predominantly of Kentucky bluegrass on a soil rootzone under sod production in Tottenham, Ontario (Figure 1). Field site was selected based on a history of grub infestation and visible signs of grub infestation at the time of treatments, 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 4 rate/formulation combinations of *B. thuringensis* and a registered standard control (imidacloprid), as well as an untreated check (Table 1). All treatments were applied at the first instar stage on 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 treatments moved to the target site. Mowing was excluded for 24 hours after application.

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

Table 1. Treatment List

1	SDS502 5G corn @ low rate: 1.3 kg 100 m^{-2}
2	SDS502 5G corn @ high rate: 1.7 kg 100 m^{-2}
3	SDS502 10G DG @ low rate: 1.3 kg 100 m^{-2}
4	SDS502 10G DG @ high rate: 1.7 kg 100 m^{-2}
5	Standard treatment – imidacloprid (Merit) at 2.8 g a.i. 100 m^{-2}
6	Untreated control

Efficacy Assessments:

Plots were surveyed for larval population densities prior to application at the beginning of the experiment (August 21, 2009), and one month after application (October 1, 2009). Larvae were recovered by direct harvest from below a 0.3 m^2 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}.

Figure 2. 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 date.

Statistical Design:

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

Results

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 78.2 larvae per m^2, 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.

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

Treatment	pre-treatment	28 DAT
Merit (granular)	78.1[1]	15.0 e
SDS502 10G @ high rate (1.6 g/ft2) DG	94.7	83.3 bcd
SDS502 10G @ low rate (1.2 g /ft2) DG	66.9	58.9 de
SDS502 5G @ high rate (1.6 g/ft2) corn	78.9	93.3 abcd
SDS502 5G @ low rate (1.2 g /ft2) corn	70.6	72.2 cd
Untreated control	80.0	88.9 abcd
lsd p=0.05	NS	47.2

[1] Mean of counts of 6 replicates, grubs counted in 0.3 m^2 strip. Means within columns followed by the same letter are not significantly different (Fishers protected LSD, p=0.05).

Efficacy assessment:

The standard insecticide treatment (imidacloprid) gave reasonable (80%) control of chafer larvae. The experimental treatments did not provide significant control at any of the formulation/rate combinations (Table 2).

Conclusions

There was no evidence of any control of European chafer larvae by the rate and formulation combinations of *Bacillus thuringiensis* when applied to early instars.