Proprietary biological control agent for control of *Popillia japonica* larva in managed turfgrass

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Abstract

A proprietary, novel organism shows promise for white grub control in managed turf grass. This study examined the efficacy of the organism to decrease the population of *Popillia japonica* in Kentucky bluegrass at different doses compared to GrubGone (Btg) and Acelepryn. The results showed that certain doses of the organism were more effective than GrubGone while other doses had no efficacy at all. No dose was as effective as Acelepryn.

Introduction

In turf management, there is very little tolerance for pests of any kind. As such, broad-spectrum insecticides are often the first solution to any signs of a *Popillia japonica* problem, despite the proven harmful effects of broad-spectrum insecticides to non-target arthropods (Larson et. al. 2014). In the case of *Popillia japonica* white grub management in turf grass, there are very few alternatives to synthetic pesticide. Milky spore is one of the more popular ones due to its ease of application, but it's not always effective (Redmond & Potter, 1995). Nematodes are currently available as well, but their efficacy varies with strain and soil condition (Helmberger et al., 2018; Selvan et al., 1994).

Certain microbes, such as *Bacillus thuringiensis* (Bt), are also used and considered effective (Emily et. al 2022; Koppenhöfer et. al 2017; Wolfenbarger et. al 2018). Current research on potential limits to microbe efficacy is limited due to how recently they have been implemented as pest control. In this study, we tested the efficacy of a proprietary microbe against GrubGone (btg) and standard, broad-spectrum pesticide (Acelepryn) as well as the efficacy of different doses of the proprietary microbe.

Methods

To test the effectiveness of our biological agent, wild, adult Japanese beetles were trapped using Trece traps and collected. The beetles were kept in the lab overnight with apple slices at 15 °C. The beetles were used to infest turf plots during the summer by driving hollow cylinders into the turf and filling them with breeding adults. The infested

turf was divided into plots that were treated with different control agents and insecticides. All treated plots were treated on August 12 and some plots treated with the proprietary control were given a second treatment on August 31. Plots treated with GrubGone were treated once at a dose of 50 lb/A and the plots treated with Acelepryn were treated with a dose of 8 oz/A. For plots treated with our proprietary organism, different doses were applied to different plots. The doses included were one treatment of 1.13 oz/A, two treatments of 1.13 oz/A, one treatment of 2.25 oz/A, and two treatments of 2.25 oz/A. The plots were sampled on September 20, 21, 27 and 28 where grubs were collected, counted, and identified. Only grubs identified as *Popillia japonica* were included in this study.

Results

At two treatments of 1.13 oz/A, the proprietary organism showed no difference than the untreated plots. At two treatments of 2.25 oz/A, the proprietary organism was just as effective as GrubGone. At one treatment of 1.13 oz/A, the proprietary organism was more effective than GrubGone, but less effective than Acelepryn. At two treatments of 2.25 oz/A, the proprietary organism was effective, but less effective than GrubGone.

Homogenous Groups, alpha = .05000
Error: Between MSE = 18.286, df = 21.000

Treatment # Protocol	JB Mean	1	2	3
1	10.25000	****		
2	2.25000		****	****
3	10.00000	****		
4	7.25000	****		****
5	5.50000	****	****	****
6	0.00000		****	
7	4.75000	****	****	****

I: Untreated

2: Proprietary control, 1 treatment of 1.13 oz/A

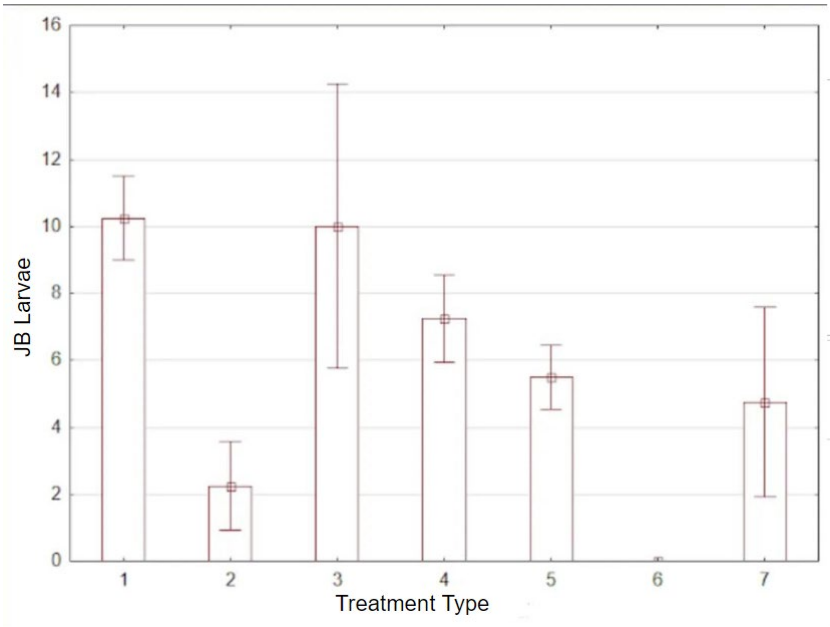
3: Proprietary control, 2 treatments of 1.13 oz/A

4: Proprietary control, 1 treatment of 2.25 oz/A

5: Proprietary control, 2 treatments of 2.25 oz/A

6: Acelepryn, 1 treatment of 8 floz/A

7: GrubGone, 1 treatment of 50 lb/A



Discussion

Legislation restricts the use of synthetic pesticides and people feel they don't have a wide variety of alternative options (Bélair et al., 2009). Milky spore is possibly the most popular option on the market right now, however, the commercial products fail to reduce grub populations (Althoff & Rice, 2022). Nematodes are also popular, but they require certain environmental conditions to survive, which means if someone buys the wrong strain or fails to properly care for their turf post-application, the nematode will die or become ineffective (Helmberger et al., 2018; Selvan et al., 1994). It's both easier and more effective to just use broad-spectrum pesticide. Btg has only recently become available commercially, however, its efficacy against white grubs is already being questioned. While our study showed Btg based GrubGone to be effective compared to untreated plots, other studies show it's potentially not effective nor selective (Redmond et al., 2019). Every angle of the current state of biocontrol in turf makes it clear that more options need to be explored. Our proprietary organism has shown to be effective in this study. The next steps would be to confirm its efficacy among different environments, such as soil type or turf species, as well as its efficacy against different turf pests. Its persistence within the soil as well as its selectivity should also be studied and evaluated.

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