Evaluation of Furfural, Abamectin and Chloropyrifos to Control Plant Parasitic Nematodes in Golf Greens, 2012

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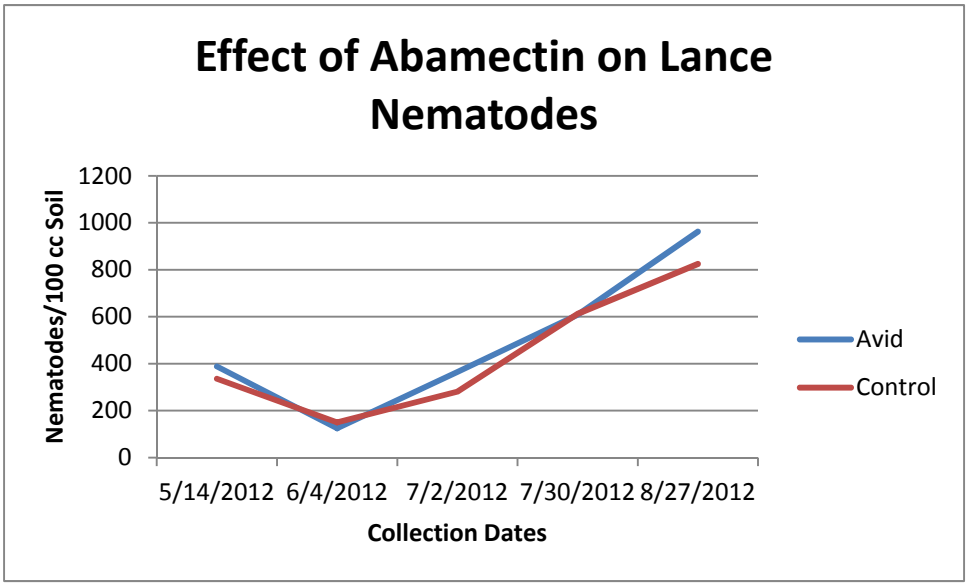
During the growing season of 2012, we tested the efficacy of Abamectin SPC 0.15 EC, Chloropyrifos 4E and Furfural (Multiguard Protect) for controlling plant parasitic nematodes in golf greens. Furfural was tested on two sites, golf courses in Albany NY and Amherst MA. Abamectin was tested on a golf course in Longmeadow MA and Chloropyrifos was tested at the UMass Joseph Troll Turf Research Farm in S. Deerfield MA.

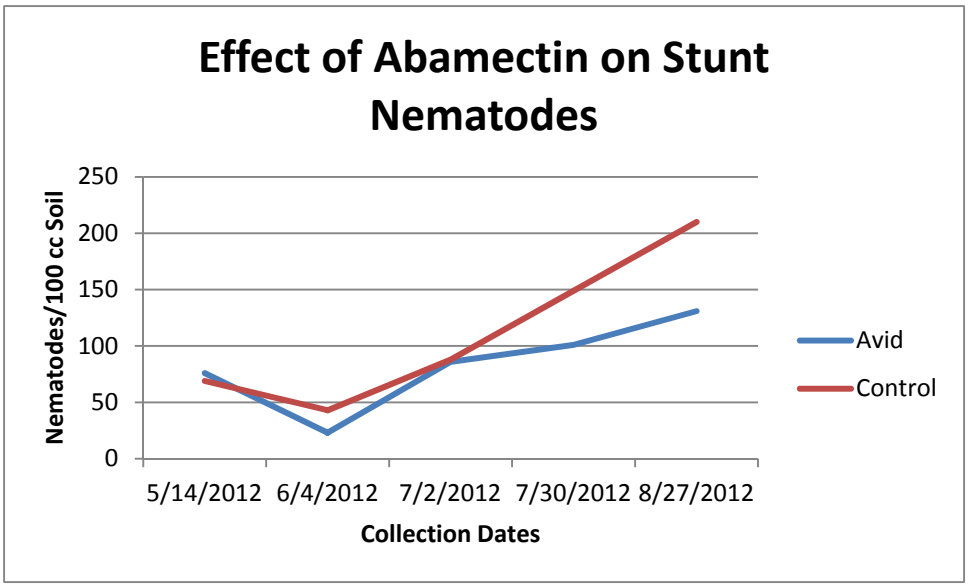
Abamectin

Abamectin is an insecticide and nematicide (for animals) and has been granted "emergency use" in some of the southern states for nematodes in turfgrasses. However, it has been considered a poor turfgrass nematicide because it gets bound up in the organic matter in the thatch and thus does not reach the target. We attempted to circumvent the organic matter problem by injecting it into the soil. A golf green in Longmeadow MA, approximately 47 years old, was chosen for the trial. The green was a mixture of annual bluegrass and creeping bentgrass. Mechanical analysis of the soil in the top 4 inches showed it to be 75.1% sand, 19.4% silt, and 5.5% clay. USDA criteria classify this soil as a sandy loam. The Abamectin treatment and control were each replicated six times (plots were 6 ft x 6 ft) and completely randomized. Abamectin was injected into the turf with a Hydroject at 8 oz/100 gal water. Three injections were made at two week intervals on 4 and 18 June and 2 July. Soil was sampled on 14 May, 4 June, 3 and 30 July and 27 August. From each plot, 10, 1 x 4 inch soil cores were taken and bulked together to comprise one sample. Nematodes were recovered by wet sieving/sugar flotation and identified to genus. The concentration of *Tylenchorhynchus* (stunt) and *Hoplolaimus* (lance) nematodes were assessed in each sample. The data were subjected to analysis of variance.

Results

There were no statistical differences between the Abamectin treatment and the control.





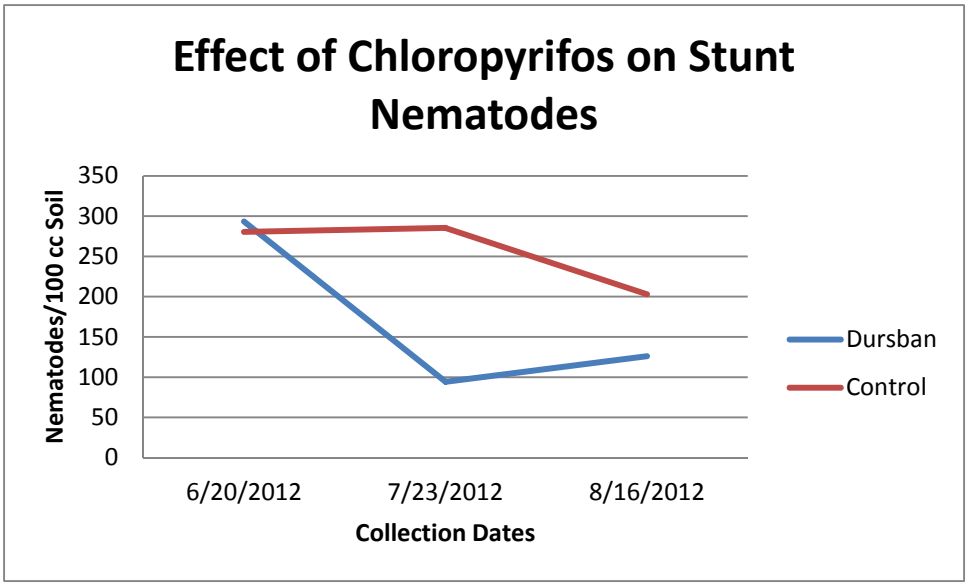
Chloropyrifos

Chloropyrifos has been rumored to be effective against plant parasitic nematodes in turfgrasses. Since no data on efficacy was available we decided to test the material. A plot of bentgrass at the Joseph Troll Turfgrass Research Farm was chosen for the trial. The Chloropyrifos treatment and control were each replicated six times (plots were 6 ft x 6 ft) and completely randomized. Chloropyrifos was watered into the turf at the rate of 3 oz/1,000 sq ft (8 lb/Acre) in a total of 108 gal water (equivalent to about 0.18 inch water). Three applications were made at two week intervals on 22 June, and 6 and 23 July. Soil was sampled on 18 June, 23 July and 15 August. From each plot, 10, 1 x 4 inch soil cores were taken and bulked together to comprise one sample. Nematodes were recovered by wet sieving/sugar flotation and identified to genus. Only *Tylenchorhynchus* (stunt) was counted at this site because the other nematodes were not dispersed throughout the plots. The data were subjected to analysis of variance.

Results

Two applications of Chloropyrifos significantly reduced stunt nematodes by July 23rd. The third application of Chloropyrifos was made immediately following soil sampling on 23 July. Surprisingly, the nematode population did not continue to decline after the third application. The apparent slight increase in the population is not significant and can be explained by the unequal distribution of nematodes in the soil. The August sampling did not show a statistical difference but the control population had started to decline on its own. This trial should be repeated during 2013.

Currently Chloropyrifos is not labeled for turfgrass nematodes but it is labeled for use on insects on golf courses. Dursban is labeled for white grubs at 4 to 8 lbs/A. Presumably, a treatment for white grubs would also control nematodes.



Multiguard

Multiguard was trialed on a golf course nursery green in Albany New York and a golf green in Amherst Massachusetts. The nursery green was only about 5 years old but it was established from aerification cores taken from greens that had a moderate to high population of stunt and lance nematodes; the nursery was a mixture of bentgrass and annual bluegrass. Textural analysis of the soil showed that it contained 81.3% sand, 10.7% silt and 7.9% clay; the USDA textural class, loamy sand. For the Amherst Golf Club study site, the green was approximately 100 years old and consisted of a mixture of bentgrass and annual bluegrass. Textural analysis of the soil showed that it contained 91.7% sand, 5.7% silt and 2.5% clay; the USDA textural class, sand.

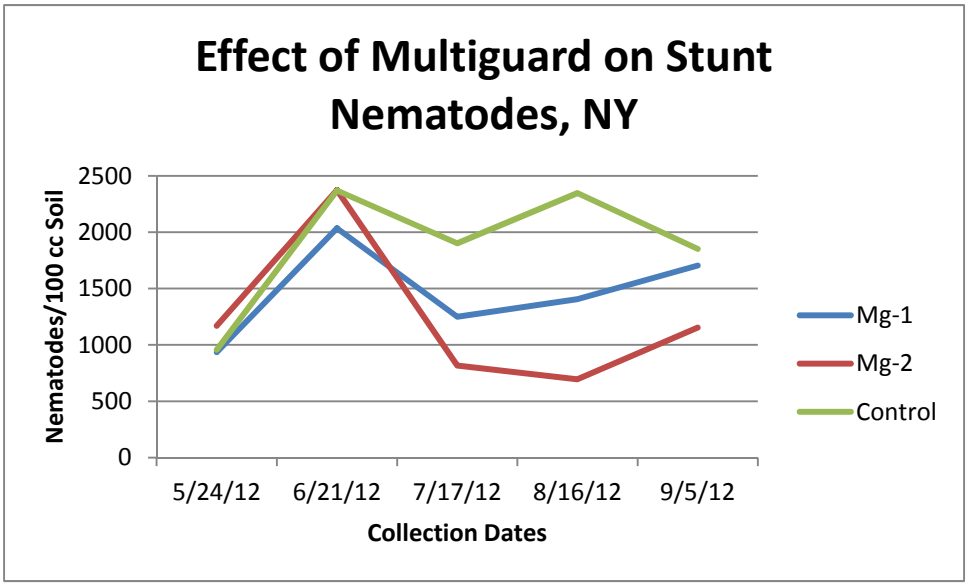
Once the pre-treatment, base-line populations in NY were established in each plot, they were sorted to even out the *Tylenchorhynchus* (stunt nematode) population so that meaningful comparisons could be made over the course of the experiment. Stunt nematodes were more important than lance nematodes at the NY site. Lance populations were distributed differently and therefore the lance population was not evenly distributed after accounting for the stunt population. For this reason, in the NY plots, the lance data is more difficult to interpret than the stunt data. In MA, the plots were equalized to favor stunt nematodes over the trichadorads (stubby root). Stubby root nematodes are not common in turf in the New England region and typically their population tends to taper off from May through September.

In each site, NY and MA, each Multiguard treatment and control was replicated six times in 6’ x 6’ plots. At the New York site, two rates were used, 5.5 gal/A and 8 gal/A; only the 8 gal/A was used at the MA site. A non-treated control was used at both sites.

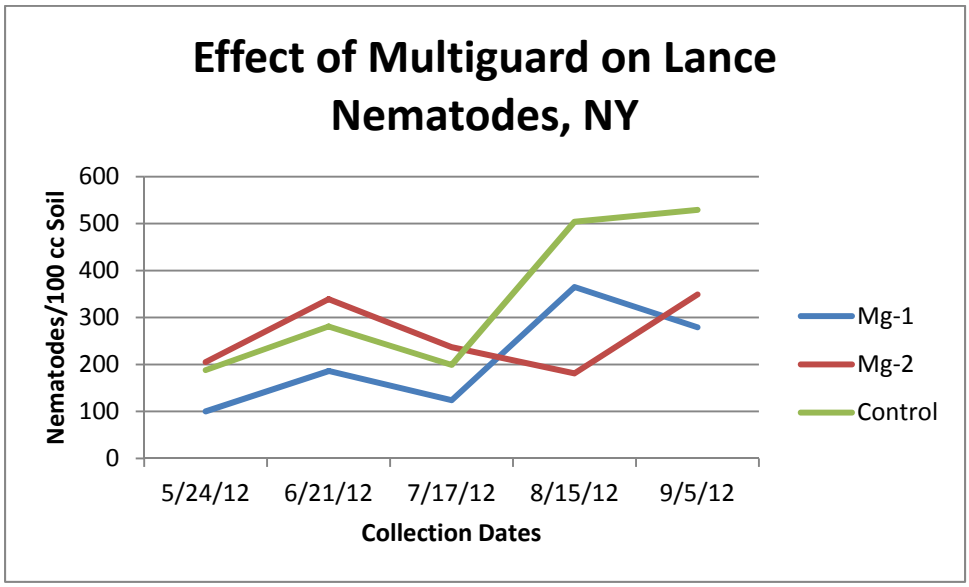
In NY the pretreatment base-line assay was done on 24 May, 2012 and subsequent assays were carried out on 21 Jun, 17 Jul, 15 Aug and 5 Sep. At the NY site, *Tylenchorhynchus* and *Hoplolaimus* were prevalent. Multiguard was applied on 24 May,7 Jun, 21 Jun, and 5 Jul. Treatments were applied in 2 gal water/ 36 sq ft and followed by another 2 gal clear water/36 sq ft; equivalent to 108 gal/1,000 sq ft (~0.18 in.). Applications were followed by approximately 0.1 in. irrigation applied by hose. In MA the pretreatment base-line assay was done on 18 May and subsequent assays were carried out on 20 Jun, 25 Jul and 22 Aug. Multiguard applications were made on 13 Jun and 27 Jun; due to phytotoxicity and very hot weather, superintendent would not allow any additional treatments of Multiguard. At the MA site, Trichodorads and *Tylenchorhynchus* were prevalent. Method of applications in MA was the same as in NY.

Results

Above digital image; Albany NY plots. There was slight phytotoxicity on the 8gal/A (MG-2) treatments and some of the 5.5 gal/A treatments resulting from the 24 May Multiguard application (phytotoxicity not visible in the above image).



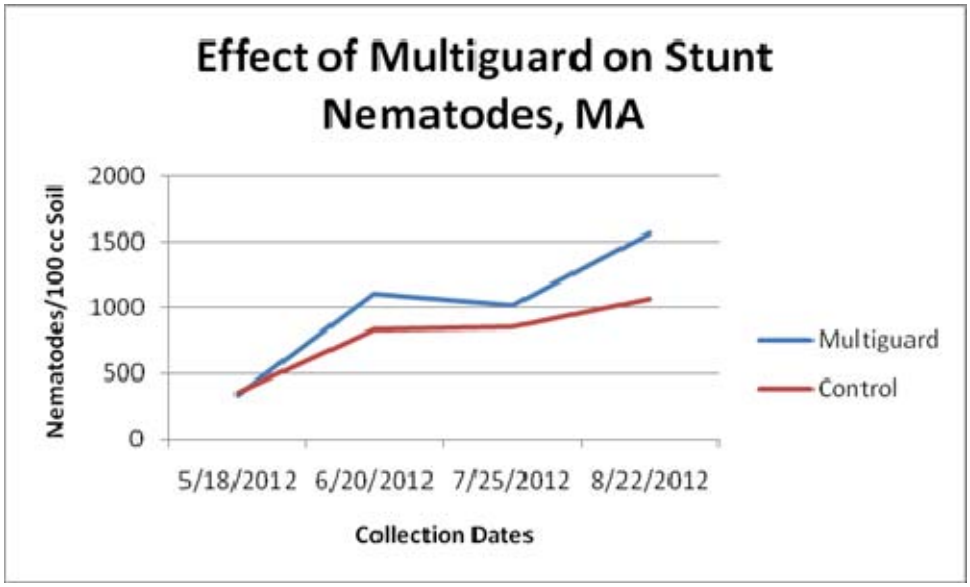
Above, effect of Multiguard on stunt nematodes, NY site. Mg-2 (8 gal/A) stunt population is significantly lower than the control for 17 Jul, 16 Aug and 9 Sept ($p=0.014$, $p=0.0078$ and $p=0.042$ respectively).



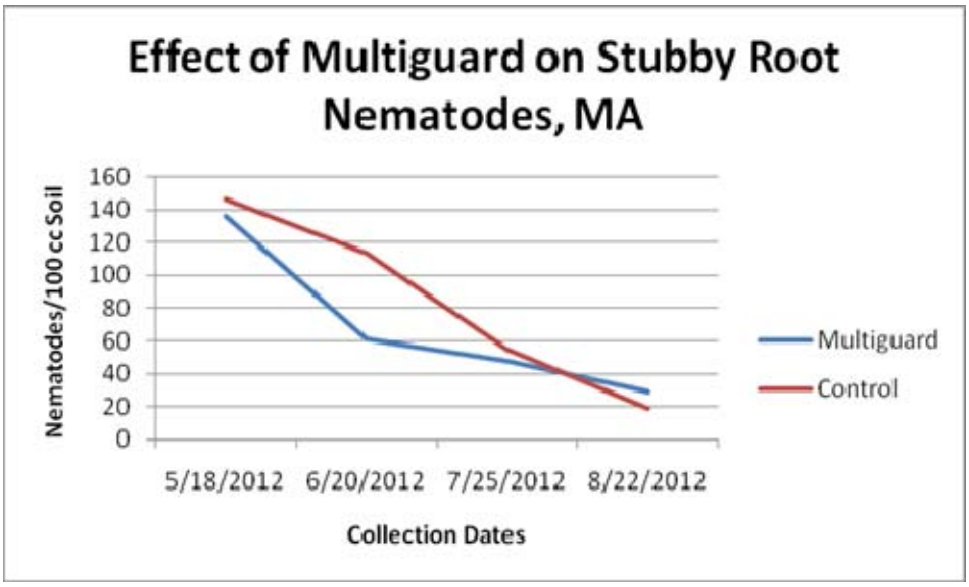
Above, effect of Multiguard on lance nematodes, NY site. According to ANOVA and Tukey HSD comparison of means, Mg-1 (5.5 gal/A) treatment has a statistically lower population of lance nematodes than the Mg-2 (8 gal/A); however, the initial populations in the Mg-1 treatment was half of that for the Mg-2 and the control.

Above, Amherst, MA Multiguard plots; image taken 22 Aug following aerification. Plot #1 is in the front left and #2 is directly behind it. Plot # 6 is to the right of plot #1. No evidence of phytotoxicity during this time.

Above, Amherst, MA site; image taken 29 Jun, 2 days after application of Multiguard. The image was taken from #1plot. Two coins mark the bottom corner boundaries of plot two. Phytotoxicity can be seen in plot # 2, #3 and #4, all treated.



Above, effect of Multiguard on stunt nematodes, Amherst MA. No statistical differences between the treated and untreated plots. Only two applications of Multiguard were carried out.



Above, effect of Multiguard on stubby root nematodes, Amherst MA. No statistical differences between the treated and untreated plots. Only two applications of Multiguard were carried out.

Conclusions for Multiguard

Multiguard significantly reduced stunt nematode populations after four applications at 8 gal/A at the New York site. Slight phytotoxicity was apparent for up to two weeks but there was no decline in turf cover. At the same site, lance nematode populations could not be adequately evaluated because their average population size per treatment could not be equalized at the onset of the trial. Plots were equalized for stunt nematodes because they were most prevalent.

A second site in Massachusetts was chosen as a back-up in the event that work could not be completed at the NY site. Unfortunately, only two applications of Multiguard at 8 gal/A could be made in MA. Phytotoxicity was apparent several days after application and the superintendent did not want to continue with treatments since the third application would have had to be made during days with temperatures in the 90's. In MA, the plots were equalized for stunt nematodes and they were not significantly affected by the Multiguard treatment. While the stubby root population is presented here as well, the population dynamic of these nematodes do not lend themselves to experimental intepretation (the population tends to move from high to low duirng the growing season; this has been observed in the past).

Applications of Multiguard were made after rainfall the previous day or after the superintendent watered the green during the evening before. Nevertheless, phytotoxicity was still apparent. More work needs to be done to lessen the possibility of injury to the grass. The formulation of the material as well as the application methods need to be examined carefully. The product has promise controlling nematodes in turfgrasses.

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