Results of Inoculaid Experiments, 2009

Bench Screen Experiment:

The objective of this experiment was to determine if Inoculaid Light, Inoculaid VSC, or the combination of the two, had an immediate nematicidal effect against sting nematode (*Belonolaimus lomgicaudatus*). A bench screen was set up using pots containing 300 cm^3 of sting nematode infested sand. Treatments were added to the pots in 100 ml of solution/pot. The treatments were 0, 0.5, 1.0, 1.5, 2.0, 2.5, 5.0, 7.5, and 10.0 gallons/acre of each formulation independently or in combination. After 72 exposure hours nematodes were extracted from the soil using a modified Baermann extraction technique that only extracts live nematodes. Regression analysis was then used to see if there was a rate response to each of the three treatments (Light, VSC, and Combination). The R^2 values obtained were 0.15, 0.18 and 0.15, and the P-values 0.30, 0.25 and 0.31 for the Light, VSC, and Combination treatments, respectively.

Growth room experiment:

The objectives of this experiment were to evaluate the short and long-term effects of Inoculaid on sting nematode. Clay pots were filled with 1,200 cm^3 of sand and then planted with creeping bentgrass seed. After the grass germinated the pots were inoculated with 300 sting nematodes/pot. The pots were arranged on a growth room bench in a randomized block design with 5 blocks. There were 5 pots for each treatment in each block. The three treatments were untreated control, both formulations of Inoculaid each applied at 1 gallon/A, and both formulations of Inoculaid each applied at 2 gallons/A. After 1 month the treatment applications began, treatments were applied every 10 days for six months. Treatments were mixed in water and delivered in 100 ml of solution per pot, untreated pots received 100 ml of water. There were four observation times for each treatment. An observation consists of one pot of each treatment from each block being selected for destructive sampling. The soil was removed from the pots and nematodes extracted by centrifugal flotation. Observation times were: 10, 20, 30, and 180 days after treatments began. At the 180-day observation, the roots from each pot were removed and analyzed with WhinRhizo equipment and software. Nematode numbers were subjected to analysis of variance and the treatment means were compared to the untreated controls using the contrast procedure. The results from these observations are shown in Table 1.

Table 1. Effects of treatments on number of sting nematodes/100 cm^3 of soil, and root length (cm) and number of root tips/pot.

Rate (gal./A)	10-day nematodes	20-day nematodes	30-day nematodes	180-day nematodes	Root length	Root tips
0	144	155	41	115	247	2074
1	126	111	37	73	305	2005
2	234	90	56	64	364**	2643**

*, **, *** Treatment means are different from the untreated control according to the contrast procedure, $P \leq 0.1, 0.05, 0.01$, respectively.

Field trial:

The objective of this experiment was to determine the effects of Inoculaid on nematode numbers in the field. The experiment was conducted on a 'Tifdwarf' bermudagrass putting green infested with sting, ring, and root-knot nematodes. The experimental design was randomized-block with 5 replications of each treatment; Untreated, and Inoculaid. The Inoculaid treatment received 2 gallons/acre each of the VSC and Light formulations initially and then 1 gallon/A of each every 10 days thereafter for 7 months. Data collected included nematode populations, turf density, and root lengths. The putting green was overseeded with Poa during the winter, and the Poa was sprayed out with herbicide in late May. So the turf density measurements through May are on the Poa. Turf density measurements after May are of the bermudagrass. The results are shown in Tables 2-4.

Table 2. Effects of treatment with Inoculaid on numbers of ring, root-knot, and sting nematodes/100 cm^3 of soil.

Treatment	3-Mar	21-May	23-Sep
	Ring nematodes / 100 cm^3 of soil		
Non-treated	99	54	4
Inoculaid	90	53	4
	Root-knot nematodes / 100 cm^3 of soil		
Non-treated	39	19	162
Inoculaid	49	26	197
	Sting nematodes / 100 cm^3 of soil		
Non-treated	56	15	> 1
Inoculaid	56	17	> 1

Data are means of 5 replications.

*, **, ***Treatment means are different from the untreated control according to analysis of covariance, $P \leq 0.1, 0.05, 0.01$, respectively.

Table 3. Effects of treatment with Inoculaid on root length (cm) and number of root tips/200 cm^3 of soil on September 23, 2009.

Treatment	Root length (mm)	Tip
Non-treated	553	3529
Inoculaid	718	5382*

*Note: Quantum Growth was formerly Inoculaid

33% increase in root length!

35% increase in # of root tips!

*, **, ***Treatment means are different from the untreated control according to the contrast procedure, $P \leq 0.1$, 0.05, 0.01, respectively.

Table 4. Effects of treatment with Inoculaid on turf density (0-100% cover by healthy turf).

	Turf density (%)											
Treatment	11-Mar	25-Mar	18-Apr	28-Apr	8-May	21-May	3-Jun	18-Jun	13-Jul	29-Jul	26-Aug	23-Sep
Non-treated	90	87	73	63	90	99	28	71	98	94	92	79
Inoculaid	90	87	73	71	94*	100*	32	80	99	93	93	80

Significant increase in turf density.

*, **, ***Treatment means are different from the untreated control according to the contrast procedure, $P \leq 0.1$, 0.05, 0.01, respectively.

This study from the University of Florida by Dr. William Crow demonstrated:
-A 33% increase in root length.
-A 35% increase in the number of root tips.
-A significant increase in turf density.

Conclusions and Discussion:

The results from all three studies did not indicate a direct effect from Inoculaid on the nematodes studied. However, in both the greenhouse and field trials treatment with Inoculaid was associated with a positive effect on turf roots. Turf density of Poa overseed was improved slightly by Inoculaid, but there were no treatment differences for bermudagrass turf density. These results are not consistent with our field trial in 2008 where we had sting nematode reductions and bermudagrass density improvement, but not root improvement. I do not have a good explanation for the contradictory results between years.

While sting nematode was present at damaging numbers at the beginning of the 2009 field trial, in both treatments they declined to near zero by the end. This reduction was not exclusive to this trial, I had two other experiments nearby and sting nematode populations decreased similarly in all of them. Perhaps if the numbers would have stayed high throughout visual differences on the bermudagrass would have been more pronounced.

In conclusion, these results do not support the hypothesis that Inoculaid is nematicidal. However, they do indicate that it might help root growth, which might help turfgrasses be more tolerant to nematode damage.

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