

Project Title: Fungicide and Insecticide Combinations for Management of Nematodes on Putting Greens

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Objectives:

- 1) To determine if labeled rates of the fungicides iprodione and thiophanate methyl are effective against plant-parasitic nematodes in the field
- 2) To determine of combinations and rotations of iprodione and thiophanate methyl with abamectin (Avid) can improve nematicide effects.

Start Date: 2014

Duration: 2 years

Total Funding: \$17,260

2014 Summary: A putting green at the University of Florida Plant Science Research Unit is being used for this trial. This green is planted with 'Jonesdwarf' bermudagrass and is naturally infested with sting nematode and root-knot nematode. The experiment was laid out in a randomized block design, blocks were based on initial sting nematode population density, with 5 replications. Plots were 16 ft² with 2-ft untreated borders between adjacent plots. Applications of all treatments were made using a CO²-powered backpack sprayer with TJ-08 nozzles delivering 6 gallons/1000 ft². After each application all plots were irrigated with 1/8-inch water.

The initial treatments were made on 22 April, 2014. Nematode samples consisted of nine 3/4-inch-diameter and 4-inch-deep soil cores collected from each plot. Nematodes were extracted from a 100 cm³ subsample by the sugar-flotation/centrifugation method. Nematode samples were collected on 20 March (before treatment), 3 June, and 29 July. Root samples were two 1.5-inch-diameter cores taken 6-inches deep from each plot (174 cm³ of soil from each core). Roots were extracted manually in water with a sieving technique. Root lengths were measured using WinRhizo equipment and software. Roots samples were collected on 22 April and 29 July. Turf percent green cover was a measure of how much of the plot area was covered by live turf. Percent green cover is determined by importation of a digital image from each plot into SigmaScan software and using a macro to determine the percentage of green pixels in the image. Green cover data was collected every two weeks.

Statistical analysis: All data was subjected to analysis of covariance with the initial measurement used as the covariant. Differences indicated are comparisons with the untreated controls using the actual *P*-value generated (*P* = 0.1, 0.05, 0.01), where no differences are indicated *P* > 0.1.

Results: Nematode numbers declined in all plots after the initiation of the experiment. While at the final sampling date nematode counts were lower in some of the treatments than in the untreated, it is difficult to say whether or not the treatments were effective against sting nematode. I believe that the turf improvement observed was from control of root-knot nematodes that were also present at the site. However, to accurately measure treatment effects on root-knot nematodes we would have had to use a different extraction method. Only treatments programs that included abamectin increased turf percent green cover after the early part of 2014. Only treatment programs that received abamectin improved root lengths. The best plant health responses occurred from program G, that included abamectin tank-mixed with a rotation of the two fungicides. Therefore, these results indicate that the fungicides alone were not effective as stand-alone programs against nematodes, but can enhance turf effects from abamectin.

Table 1. Treatment regimens used in a two-year field trial evaluating effects on sting nematode (*Belonolaimus longicaudatus*) and plant health of 'Jones Dwarf' bermudagrass.

Code	Treatment	Trade Name	Rate a.i ha ⁻¹	Applications on Week
U	Ethylene Glycol Butyl Ether	Lesco Wet Plus	22.6 kg	0, 2, 4, 6, 8, 10, 12
B	Iprodione	Iprodione SPC	6.1 kg	0, 4, 8, 12
	Ethylene Glycol Butyl Ether	Lesco Wet Plus	22.6 kg	0, 2, 4, 6, 8, 10, 12
C	Thiophanate-Methyl	Cleary's 3336 Plus	6.1 kg	0, 2, 4, 6, 8, 10, 12
	Wetting Agent	Lesco Wet	22.6 kg	0, 2, 4, 6, 8, 10, 12
D	Abamectin	Avid 0.15 EC	17.5 g	0, 2, 4, 6, 8, 10, 12
	Ethylene Glycol Butyl Ether	Lesco Wet Plus	22.6 kg	0, 2, 4, 6, 8, 10, 12
E	Iprodione	Iprodione SPC	6.1 kg	0, 4, 8, 12
	Thiophanate-Methyl	Cleary's 3336 Plus	6.1 kg	0, 4, 8, 12
	Ethylene Glycol Butyl Ether	Lesco Wet Plus	22.6 kg	0, 2, 4, 6, 8, 10, 12
F	Iprodione	Iprodione SPC	6.1 kg	0, 4, 8, 12
	Thiophanate-Methyl	Cleary's 3336 Plus	6.1 kg	2, 6, 10
	Ethylene Glycol Butyl Ether	Lesco Wet Plus	22.6 kg	0, 2, 4, 6, 8, 10, 12
G	Iprodione	Iprodione SPC	6.1 kg	0, 4, 8, 12
	Thiophanate-Methyl	Cleary's 3336 Plus	6.1 kg	2, 6, 10
	Abamectin	Avid 0.15 EC	17.5 g	0, 2, 4, 6, 8, 10, 12
	Ethylene Glycol Butyl Ether	Lesco Wet Plus	22.6 kg	0, 2, 4, 6, 8, 10, 12
H	Iprodione	Iprodione SPC	6.1 kg	0, 4, 8, 12
	Thiophanate-Methyl	Cleary's 3336 Plus	6.1 kg	0, 4, 8, 12
	Abamectin	Avid 0.15 EC	17.5 g	2, 6, 10
	Ethylene Glycol Butyl Ether	Lesco Wet Plus	22.6 kg	0, 2, 4, 6, 8, 10, 12

Table 2. Effects of the treatment regimens shown in Table 1 on population density of sting nematode (*Belonolaimus longicaudatus*) in a field trial conducted on 'Jones Dwarf' bermudagrass in 2014 and 2015.

Code	2014		2015	
	Pi	Pf	Pi	Pf
U	30	4	14	9
B	28	9	11	5
C	31	8	5	3**
D	28	14**	15	2***
E	31	8	17	3***
F	28	10	9	2***
G	28	13*	6	4
H	32	11	7	4*

Data are means of 5 replications.

Code for treatment regimen listed in Table 1.

Pi = initial population density of sting nematode 100 cm³ of soil⁻¹.

Pf = final population density of sting nematode 100 cm³ of soil⁻¹.

*, **, *** Different from the untreated control according to analysis of covariance ($P \leq 0.1$, $P \leq 0.05$, $P \leq 0.01$, respectively).

Table 3. Effects of the treatment regimens shown in Table 1 on root length in a field trial conducted on 'Jones Dwarf' bermudagrass infested with sting nematodes in 2014 and 2015.

Code	2014		2015	
	Initial	Final	Initial	Final
U	231	209	388	526
B	209	293	252	637
C	277	251	324	651
D	267	219	345	935***
E	300	229	312	560
F	262	241	316	551
G	275	273	337	878**
H	221	269	358	856***

Data are means of 5 replications.

Code for treatment regimen listed in Table 1.

Root length 350 cm³ of soil⁻¹.

*, **, *** Different from the untreated control according to analysis of covariance ($P \leq 0.1$, $P \leq 0.05$, $P \leq 0.01$, respectively).

Table 4. Effects of the treatment regimens shown in Table 1 on turf percent green cover in a field trial conducted on 'Jones Dwarf' bermudagrass infested with sting nematodes in 2014 and 2015.

Code	2014									2015							
	4/22	5/6	5/20	6/3	6/16	7/1	7/15	7/29	8/12	4/1	4/15	4/28	5/13	5/27	6/10	6/24	7/8
U	7	14	11	21	36	15	16	10	10	5	34	42	27	48	1	44	41
B	6	13	16***	31***	44*	18	20*	12	11	4	36	41	31	53	2	50	43
C	7	12	12	22	42	18	15	10	6	5	34	42	38	55	2	54	43
D	7	11	12	26	52**	24**	41***	25***	28***	6	37	49	39	60	2	64**	61**
E	6	13	11	27**	43*	15	21**	13	10	6	27	33	26	41	2	39	34
F	6	8	10	20	39*	14	15	6	5	5	28	40	29	43	2**	37	31
G	6	12	12	30***	63***	28***	49***	32***	26***	4	35	47	37*	63**	2	69***	62***
H	5	8	9*	20*	44***	23***	32***	21***	13**	5	32	42	34	54**	2	58**	51*

Data are means of 5 replications.

Code for treatment regimen listed in Table 1.

Percent green cover (0-100%).

*, **, *** Different from the untreated control according to analysis of covariance ($P \leq 0.1$, $P \leq 0.05$, $P \leq 0.01$, respectively).