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Nematode Management in Florida Organic Strawberries

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Summary

Biological nematicides showed limited impact on sting nematodes in the field or the greenhouse. Brilliance yielded better than Sensation in the organic nematicide field trial, but Sensation yielded better than all other cultivars in the transplant steam field trial. Steam treatment had little effect on strawberry vigor and yield.

Background

Nematode management options in organic strawberries are limited. In the past years, it has become clear that sting nematode is one of the main problems for organic strawberry production in Florida. Without fumigants, the only option for organic growers to manage nematodes is to use cultural practices (crop rotation, cover crops) and apply bio-nematicides and organic approved soil amendments. It is therefore critical that we start generating baseline data on the usefulness of these products in Florida strawberries. Also, as variety testing of FL varieties is always done on fumigated land, there is no information on how these varieties compare under organic (non-fumigated) management. Another future option for organic growers could be steam treatment of transplants before planting which has shown to be an effective method to rid transplants of diseases, mites and nematodes.

Field trials were conducted at the GCREC certified organic field from October 2020-April 2021 to evaluate the above. In addition, organic nematicides were also evaluated in greenhouse trials at the GCREC.

Methods

Two field trials were done at the newly established organic research farm at the GCREC. In the first trial seven biological nematicides were tested on two strawberry varieties (FL Brilliance and Sensation) (Table 1). Products were all applied thru the drip irrigation system (1 drip tape in the center of the bed) in 38 ft long plots. All treatments were applied three times, the first application was done within 1 week after planting, and the following applications 3 and 6 weeks after the first application. A second field trial was done evaluating the effect of transplant

steaming on seven strawberry cultivars (Table 2). Steam treatments were done a few days before planting in the steam chamber at the GCREC.

Bare-rooted strawberry seedlings were transplanted on October 15, 2020. Each cultivar was planted in 13 ft double-row sections within each treated plot. The experiment was conducted as a randomized complete block design with five replicates per treatment. OMRI-approved fertilizer was applied throughout the season. No insecticide or fungicide sprays were done, and weeds were hand-pulled as needed. Crop stand was counted at different time points. Plant vigor was measured every two weeks by using a GreenSeeker™ hand-held sensor (Trimble, Sunnyvale, CA, USA) which generates a normalized difference vegetation index (NDVI) value based on the reflection of infrared light from the plant canopy. Harvest was performed weekly from December 2020 to March 2021.

The same organic nematicides as well as some chemical nematicides (Nimitz, Velum, Salibro and Vydate), were also evaluated against sting nematodes in a strawberry greenhouse trial at the GCREC. Pots were filled with pasteurized soil, inoculated with sting nematodes and planted with strawberry seedlings. Sting nematode populations were counted after 10 weeks.

Results

Nematode pressure in the organic field was low. None of the biological nematicides adversely affected crop stand, plant vigor and yield of the two strawberry varieties, confirming results from last year (Tables 3 and 4). The same organic nematicides as well as some chemical nematicides, were also evaluated against sting nematodes in a strawberry greenhouse trial at the GCREC. Two chemicals, Velum and Nimitz, gave good control of sting nematode, but little effect was seen from the biological products (Fig. 1).

Significant differences were seen between cultivars in the organic nematicide field trial. Brilliance gave consistently higher yield than Sensation in this experiment (Table 4). However, in the transplant steam field trial Sensation yielded better than all other cultivars. Steam treatment improved early establishment slightly, but had little effect on strawberry vigor and yield. Nematode counts were low throughout the trial (Tables 5 and 6).

Contact

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Table 1. Bio-nematicide application timing and rates			
Treatment	**Bio-nematicides**	**Rate/A**	**Application timing**
1	Majestene	2 gal + 1 gal (x2)	At plant + 3 wap + 6 wap
2	Dazitol	5.35 gal	At plant + 3 wap + 6 wap
3	Kyte Gold	3 qt	At plant + 3 wap + 6 wap
4	Nemakill	0.375%	At plant + 3 wap + 6 wap
5	ProMax	1 gal	At plant + 3 wap + 6 wap
6	Ecozin+	56 oz	At plant + 3 wap + 6 wap
7	Melocon	4 lbs	At plant + 3 wap + 6 wap
8	BioFence	4.5 lbs	At plant + 3 wap
9	Minuet	24 oz	At plant + 3 wap + 6 wap
10	UTC		
UTC: Untreated control; Wap: weeks after planting			

Table 2. Strawberry varieties used in the field experiment with and without steaming prior to planting			
Variety	**Strawberry cv.**	**Nursery**	**Steam @ GCREC**
1	Sensation	Crown	yes (A) + no (B)
2	Beauty	Crown	yes (A) + no (B)
3	Festival	Crown	yes (A) + no (B)
4	Brilliance	Crown	yes (A) + no (B)
5	Radiance	Crown	yes (A) + no (B)
6	Winterstar	Crown	yes (A) + no (B)
7	Elyana	Crown	yes (A) + no (B)

Table 3. Effect of bio-nematicides on plant growth parameters of two strawberry varieties, GCREC, organic field, 2020-21														
Factor		Crop stand (DAP)				Plant vigor (DAP)								
	Treatment	13	48	91	132	13	29	41	55	69	83	98	111	125
Product	Majestene	20	20	19	19	0.2	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7
	Dazitol	20	20	19	19	0.2	0.4	0.5	0.6	0.7	0.6	0.6	0.6	0.7
	Kyte Gold	20	20	18	18	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7
	Nemakill	20	20	19	19	0.3	0.4	0.5	0.6	0.7	0.6	0.7	0.7	0.7
	ProMax	20	20	19	19	0.2	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7
	Ecozin+	20	20	19	19	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7
	Melocon	20	20	19	18	0.3	0.4	0.5	0.6	0.7	0.6	0.6	0.6	0.7
	BioFence	20	20	19	19	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7
	Minuet	20	20	19	18	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7
	UTC	20	20	19	19	0.3	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.7
Variety	Sensation	20	20	**18 b**	**18 b**	0.2	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7
	Brilliance	20	20	**20 a**	**20 a**	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.7	0.7
Treatment means with different letters indicate statistical significant difference (P-value ≤ 0.05)														

Table 4. Effects of bio-nematicides and two strawberry varieties on yield, GCREC, organic field, 2020-21				
Factor	Treatment	The first half of the season (kg)	The second half of the season (kg)	Total yield (kg)
Nematicide	Majestene	0.6	1.3	1.9
	Dazitol	0.6	1.2	1.8
	Kyte Gold	0.9	1.5	2.4
	Nemakill	0.8	1.8	2.6
	ProMax	0.9	1.4	2.3
	Ecozin+	0.6	1.4	2.0
	Melocon	0.6	1.2	1.8
	BioFence	0.9	1.6	2.6
	Minuet	0.7	1.7	2.4
	UTC	0.7	1.7	2.3
Variety	Sensation	**0.5 b**	**1.3 b**	**1.7 b**
	Brilliance	**0.9 a**	**1.7 a**	**2.7 a**
Treatment means with different letters indicate statistical significant difference (P-value ≤ 0.05)				

Table 5. Effect of steam treatment on plant growth parameters of strawberry varieties, GCREC, organic field, 2020-21														
Factor	Variety	Crop stand (DAP)				Plant vigor (DAP)								
		13	48	91	132	13	29	41	55	69	83	98	111	125
Variety	Sensation	20	20	20	20	0.3	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.8
	Beauty	20	20	20	20	0.2	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.6
	Festival	20	19	19	19	0.2	0.4	0.5	0.6	0.6	0.6	0.7	0.7	0.7
	Brilliance	20	20	19	19	0.2	0.3	0.4	0.5	0.6	0.5	0.6	0.6	0.6
	Radiance	20	20	20	20	0.2	0.3	0.5	0.6	0.6	0.6	0.7	0.7	0.7
	Winterstar	20	19	19	19	0.2	0.3	0.5	0.6	0.6	0.6	0.6	0.6	0.7
	Elyana	20	20	20	20	0.3	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.7
Steaming	Steaming	20	**20 a**	**20 a**	**20 a**	0.2	0.4	0.5	0.6	0.6	0.6	0.7	0.6	0.7
	Non-steaming	20	**19 b**	**19 b**	**19 b**	0.2	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7
Treatment means with different letters indicate statistical significant difference (P-value ≤ 0.05)														

Table 6. Effect of steam treatment on yield of strawberry varieties, GCREC organic field, 2020-21				
Factor	Variety	The first half of the season (kg)	The second half of the season (kg)	Total yield (kg)
Variety	Sensation	**0.8 a**	**3.8 a**	**4.6 a**
	Beauty	0.4 bc	1.7 bc	2.1 bc
	Festival	0.2 c	1.9 bc	2.1 bc
	Brilliance	0.6 b	1.9 cb	2.5 bc
	Radiance	0.6 b	2.7 b	3.2 b
	Winterstar	0.3 c	2.3 b	2.5 bc
	Elyana	0.3 c	1.1 c	1.4 c
Steaming	Steamed	0.5	2.3	2.8
	Non-steamed	0.4	2.1	2.5
Treatment means with different letters indicate statistical significant difference (P-value ≤ 0.05)				

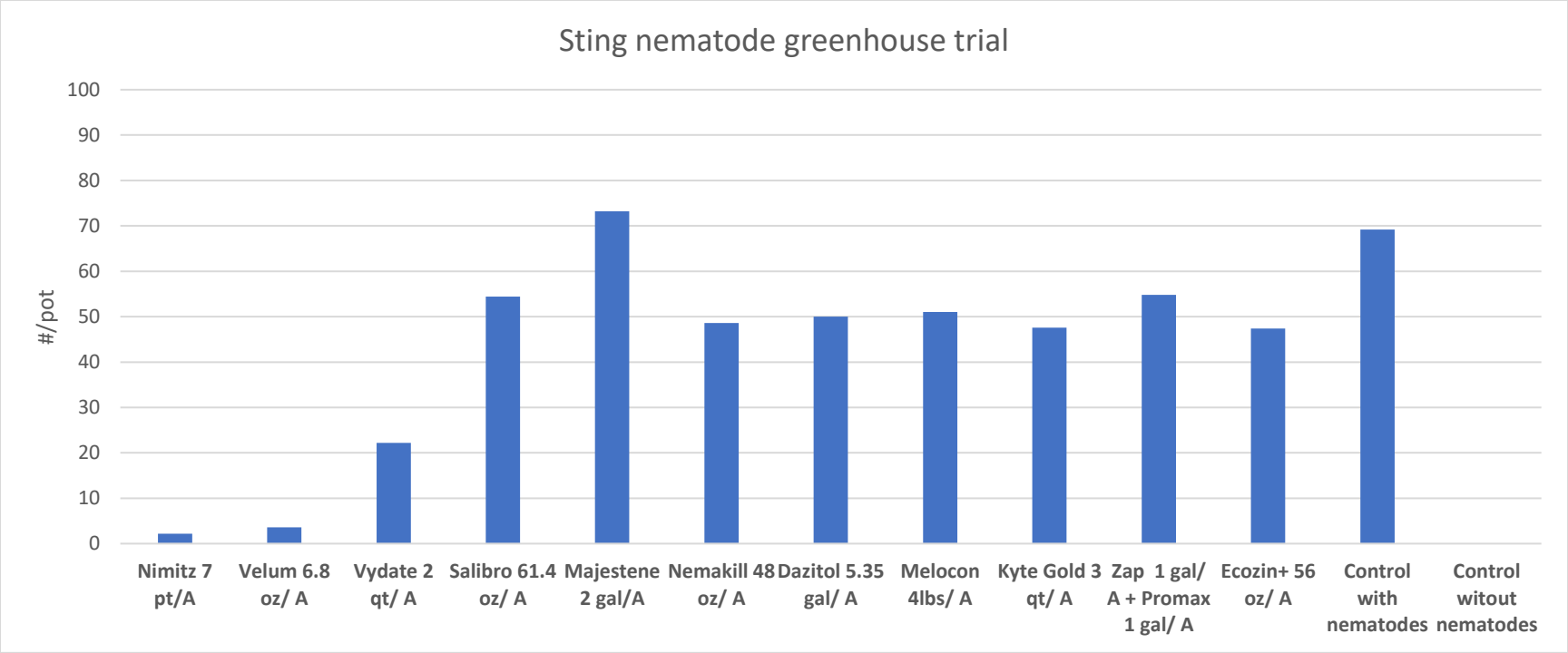

Fig. 1 Effect of different chemical and biological nematicides on sting nematode populations in greenhouse pots (strawberry, GCREC, 2020-21)