

NEMATODE MANAGEMENT IN WALNUT ORCHARDS - 2005

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ABSTRACT

Lesion (*Pratylenchus vulnus*) and ring (*Mesocriconema xenoplax*) nematodes reduce walnut yields through root damage from direct feeding and by placing trees under stress (Lownsbery, 1956 and 1959; Lownsbery et al., 1978). Lesion nematodes are likely to be found within roots as well as in soil, while ring nematodes are external parasites. At the present time, there are no cultural management techniques available for reducing nematode damage to walnuts to an economically acceptable level in established orchards and only a single nematicide is registered for post-plant use. This is the “biological” nematicide DiTera (a toxin produced by a fungus that is produced by Valent Laboratories) that achieved registration as a result of data developed in this project.

In 2003, a trial to evaluate the efficacy of a promising new bionematicide was initiated in an orchard previously used for an own-rooted Chandler compared to Chandler on Paradox rootstock trial. This orchard has a history of infestation with *P. vulnus* and baseline yield data were obtained for each tree in the orchard in the fall of 2002. Treatments are comparing the currently registered bionematicide DiTera with a new product Quillaja 35% which is an extract of the Soapbark tree. Desert King is actively pursuing registration of the product with both CA and US EPA and there is promising efficacy data on grapes and tomatoes in Chile. DiTera (50 pounds ai/acre) and Quillaja (2.5 gallons/acre) were applied in the spring and fall of 2003 (April 11 and October 24), 2004 (April 6 and September 29), and 2005 (April 11 and October 13) in a band covering half of the area, so that actual amounts applied per acre were 25 pounds of DiTera and 1.25 gallons of Quillaja. In a vigor rating of trees on October 28, 2005, both DiTera and Quillaja treated trees appeared more vigorous than the untreated, although this was only statistically significant for Quillaja on Paradox rootstock. Although not statistically significant, there are trends in the data for increases in yield on Paradox rootstock for both DiTera and Quillaja, and increases in trunk circumference for Quillaja on Paradox and DiTera on own-root. There are also trends for improvements in percent large sound and percent light. Nematode samples have not shown any differences between treatments.

In 2004, an additional trial was initiated in a drip irrigated orchard in San Joaquin County. It consists of DiTera, two rates of Quillaja, and Fulvic Acid treatments with four replicates per treatment. Treatments have been applied in the spring of 2004 and 2005. Fall 2005 sampling for nematodes indicated a reduction in populations of lesion nematode for all treatments. Quillaja at 2.5 gpa has a significantly increased tree circumference compared to the check.

OBJECTIVES

1. Optimize sampling strategies and treatment timing for lesion and ring nematode on walnuts.
2. Evaluate performance of Quillaja 35% and DiTera in a Sutter County orchard.

PROCEDURES

1. Optimize sampling strategies and treatment timing for lesion and ring nematode on walnuts.

In 2004, a trial was initiated in a drip irrigated orchard in San Joaquin County. It consists of DiTera, two rates of Quillaja (2.5 and 4 gpa), and Fulvic Acid treatments with four replicates per treatment. Treatments are applied through the drip irrigation system. Treatment effectiveness is being evaluated via soil and root sampling, and trunk circumference measurements. Data is being analyzed using analysis of variance followed by independent contrasts for mean separation.

2. Evaluate performance of Quillaja 35% and DiTera in a Sutter County orchard.

The study site is located in Sutter County in northern California on Holillipah loamy sand. Two rootstocks, micropropagated ‘Chandler’ on its own-roots and nursery grafted ‘Chandler’ on seedling Paradox rootstock were planted in 1991 in a randomized complete block design spaced at 7.6 m x 7.6 m. Trees are irrigated using microsprinklers.

The nematicide trial has 10 individual tree replicates per treatment (5 Paradox and 5 own-rooted) for DiTera DF and Quillaja 35% in a randomized complete block design. In addition, a new formulation of DiTera is being evaluated on 2 Paradox and 5 own-rooted trees. Treatments were applied in 2003 (April 11 and October 24), 2004 (April 6 and September 29), and 2005 (April 11 and October 13), and incorporated with irrigation. The new formulation of DiTera was not applied to both rootstocks on all dates due to insufficient product being available. Data for the new formulation has not been included in the figures.

Root and soil samples were taken using a 5 cm bucket auger to a depth of 60 cm midway between the dripline and tree trunk in the fall and spring of each year. Nematodes were extracted from a 400 cm³ soil sub-sample with a modified semiautomatic elutriator and sucrose centrifugation technique (Byrd et al., 1976). Data were analyzed using analysis of variance followed by independent contrasts for mean separation.

RESULTS AND DISCUSSION

1. Optimize sampling strategies and treatment timing for lesion and ring nematode on walnuts. Fall 2005 sampling for nematodes indicated a reduction in populations of treatments (Table 1). Quillaja at 2.5 gpa has a significantly increased tree circumference compared to the check (Figure 1).

2. Evaluate performance of Quillaja 35% and DiTera in a Sutter County orchard.

In a vigor rating of trees on October 28, 2005, both DiTera and Quillaja treated trees appeared more vigorous than the untreated, although this was only statistically significant for Quillaja on Paradox rootstock (Figure 2). Although not statistically significant, there are trends in the data for increases in yield on Paradox rootstock for both DiTera and Quillaja (Figure 3), and increases in trunk circumference for Quillaja on Paradox and DiTera on own-root (Figure 4). There are also trends for improvements in percent large sound (Figure 5) and percent light (Figure 6). Nematode samples have not shown any differences between treatments (Table 2).

LITERATURE CITED

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Table 1. Effects on nematode populations in San Joaquin County drip Irrigation trial

Treatment	Sample Date	Nematodes / liter of soil						Lesion / gram of root	
		Lesion Nematode		Ring Nematode		Pin Nematode			
		Std. Error	Different than Check	Std. Error	Different than Check	Std. Error	Different than Check		
Check	April 2004	3,525	444	1,088	480	0	0	0 0	
DiTera		1,625	566	638	638	338	338	1 1	
Fulvic Acid		5,400	3,123	1,575	589	1,425	1,425	0 0	
Quillaja 2.5		2,863	1,657	63	38	525	525	0 0	
Quillaja 4		4,613	2,087	825	375	750	750	0 0	
Check	October 2004	4,538	1,386	5,963	2,479	0	0	27 25	
DiTera		3,513	2,374	300	300 0.01	188	188	15 15	
Fulvic Acid		3,738	1,939	4,013	2,258	150	150	29 26	
Quillaja 2.5		3,725	1,860	250	218 0.01	38	38	28 22	
Quillaja 4		2,213	585	1,950	914 0.02	563	359	6 5	
Check	April 2005	4,813	1,306	4,163	1,593	0	0	5 5	
DiTera		4,213	2,533	1,850	907	0	0	4 4	
Fulvic Acid		1,563	719	625	338 0.05	1,125	1,125	0 0	
Quillaja 2.5		3,450	1,458	1,575	756	525	525	3 3	
Quillaja 4		1,938	671	1,788	719	1,388	895	6 4	
Check	October 2005	9,325	6,235	825	309	0	0	19 14	
DiTera		4,725	2,386 0.1	3,175	1,565	825	825	0 0	
Fulvic Acid		2,325	1,158 0.02	6,900	2,197 0.01	3,000	3,000 0.03	1 1	
Quillaja 2.5		4,988	2,518 0.1	3,113	1,366	3,750	3,651 0.01	3 3	
Quillaja 4		2,813	1,696 0.03	2,963	338	1,650	581	10 8	

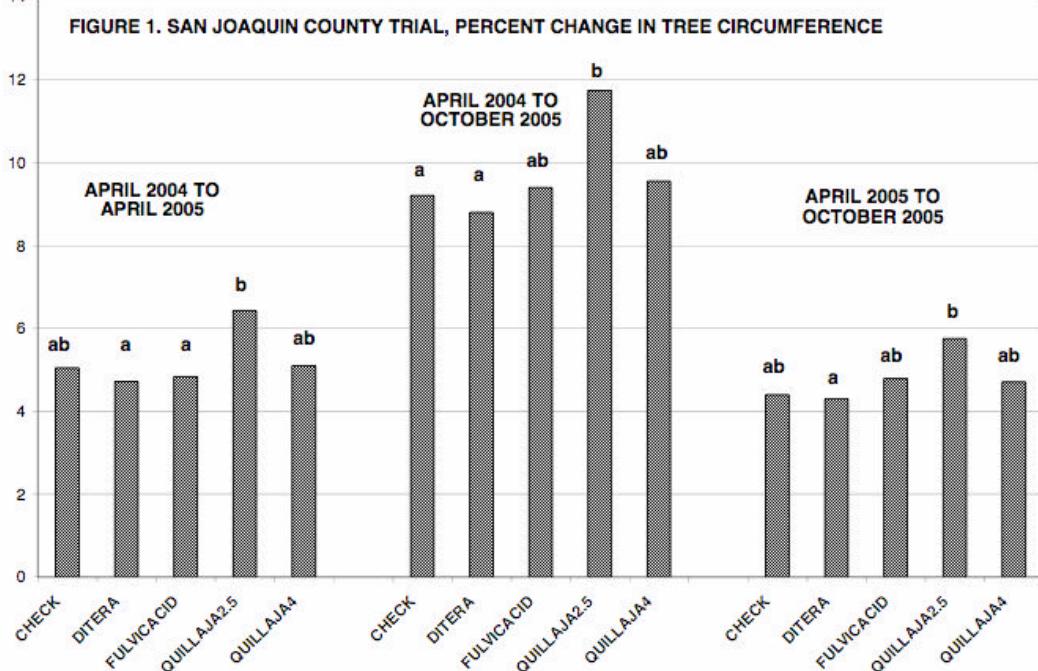


Table 2. Effects on nematodes in Sutter County trial.

Treatment	Sample Date	Paradox				Own-rooted			
		Lesion Nematode		Ring Nematode		Lesion Nematode		Ring Nematode	
		Mean	Std. Error	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error
Check	October 2003	3,030	1,288	0	0	4,380	638	10	10
DiTera		3,200	964	0	0	5,740	1,736	100	100
Quillaja		3,820	481	0	0	4,410	1,433	0	0
Check	April 2004	1,440	860	40	29	2,560	1,194	110	56
DiTera		1,330	571	540	540	2,020	608	3,270	2,803
Quillaja		1,320	451	300	300	1,870	818	0	0
Check	October 2004	1,130	435	20	20	1,230	293	450	414
DiTera		2,250	990	30	30	2,470	404	3,830	3,109
Quillaja		1,210	378	420	246	1,580	519	0	0
Check	April 2005	870	833	40	24	610	220	300	300
DiTera		1,410	621	0	0	580	237	2,480	2,285
Quillaja		2,290	1,079	260	260	1,350	539	10	10
Check	October 2005	1,470	513	10	10	1,890	529	1,380	926
DiTera		2,060	157	30	30	2,580	1,011	2,340	1,318
Quillaja		2,850	810	540	271	4,970	2,159	30	30

