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 and 2004. Harvest data indicated a significant yield increase from 2002 to 2003 for the DiTera DF (*P* = 0.05) and Quillaja (*P* = 0.03) treatments on own-rooted trees. There is a trend towards increasing trunk circumference on own-rooted trees in both the DiTera and Quillaja treatments. For Paradox, this trend is only evident for the Quillaja treatment. It also appears that yields are increasing for DiTera treated trees on both rootstocks. Treatments also appear to be improving nut quality, with respect to percent large sound and percent edible yield. Nematode samples taken following harvest in 2003, spring and fall 2004, did not show significant differences among treatments, but continued the trend for own-rooted trees to have more nematodes than Paradox.

During the past year, two additional trials were initiated in walnut orchards in San Joaquin County. One trial was initiated to determine if there is an optimum time of the year to apply postplant nematicides. The design is a randomized complete block trial with six replicates per treatment. Treatments include an untreated check and DiTera applied either once, twice, or three times per year with the first treatment beginning in July, October, January, or April. This treatment timing includes times of the year when soil nematode populations are abundant and root populations are low and times when populations are relatively higher in roots and lower in soil. Treatment effectiveness will be evaluated via soil and root sampling, and trunk circumference measurements. The second trial was initiated in a drip irrigated orchard. It consists of DiTera, Quillaja, and Fulvic Acid treatments with four replicates per treatment. First
treatments were applied in the spring of 2004. Fall sampling for nematodes indicated a reduction in populations of ring nematode with both DiTera and Quillaja treatments, but not in lesion nematode populations.

**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.

During the past year, two additional trials were initiated in walnut orchards in San Joaquin County. One trial was initiated to determine if there is an optimum time of the year to apply postplant nematicides. The design is a randomized complete block trial with six replicates per treatment. Treatments include an untreated check and DiTera applied either once, twice, or three times per year with the first treatment beginning in July, October, January, or April. This treatment timing includes times of the year when soil nematode populations are abundant and root populations are low and times when populations are relatively higher in roots and lower in soil. The second trial was initiated in a drip irrigated orchard. It consists of DiTera, Quillaja, and Fulvic Acid treatments with four replicates per treatment. First treatments were applied in the spring of 2004. 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 April and October of 2003 and 2004 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 cm$^3$ 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.

Following the first spring treatment, fall sampling for nematodes indicated a reduction in populations of ring nematode with both DiTera and Quillaja treatments in the drip irrigated trial, but not in lesion nematode populations.

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

Harvest data indicated a significant yield increase from 2002 to 2003 for the DiTera DF (P = 0.05) and Quillaja (P = 0.03) treatments on own-rooted trees. There is a trend towards increasing trunk circumference on own-rooted trees in both the DiTera and Quillaja treatments (Figure 1). For Paradox, this trend is only evident for the Quillaja treatment (Figure 2). It also appears that yields are increasing for DiTera treated trees on both rootstocks (Figures 3 and 4). Treatments also appear to be improving nut quality, with respect to percent large sound and percent edible yield (Figures 5 and 6). Nematode samples taken following harvest in 2003, spring and fall 2004, did not show significant differences among treatments but continued the trend for own-rooted trees to have more nematodes than Paradox.

LITERATURE CITED


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