

Nematodes in pistachio orchards

Michael V. McKenry □ Joseph O. Kretsch

During the 1940s a U.S. Department of Agriculture selection program for rootstocks of pistachio (*Pistacia* spp.) included those with resistance to the root knot nematodes *Meloidogyne* spp. From the early 1960s until 1975, pistachio acreage in California increased from less than 650 to more than 32,000 acres.

In 1981, we began a nematode sampling survey across the planted acreage to determine which nematode species are associated with pistachio production, especially in orchards exhibiting poor tree growth or damage by *Verticillium* wilt.

Pistachio growers primarily use rootstocks of *Pistacia atlantica* Desf. and *P. terebinthus* L. Newer replants and some complete orchards, however, are planted to *P. integerrima* which has more recently been selected for increased vigor and greater tolerance to the fungus *Verticillium dahliae*. Pistachio orchards are planted on a wide variety of soils, including sands and clays.

Experience with other perennial crops suggests that a nematode survey should give attention to geographical location, cropping history, soil characteristics, plant age and vigor, irrigation methods, rootstocks, and weeds. The survey would indicate contrasts in nematode populations among the trees growing well and poorly across a given field.

We conducted this survey in a non-random fashion: the orchards selected statewide had conditions, such as sandy soils, or cropping histories that were conducive to nematode buildup. The prevailing field situations were recorded as an integral component of our survey.

Our greatest sampling effort occurred near Lost Hills, Terra Bella, McFarland, Parlier, Madera, and Chico, California. We queried orchardists about plantings with soil-borne problems. Using their records, we sampled orchards most likely to contain nematodes.

Soil samples were taken to a depth of 2 feet from the berm area, beneath the canopy edge and adjacent to drip-line emitters, if they were present. Most of the orchards sampled had few or no weeds growing in the berm area as a result of herbicide or tillage patterns. In some northern California orchards, however, the orchard floor was a complete sod. Soil samples were taken from three

to five trees from the edge of an area showing poor growth, and comparative samples were taken from an adjacent area of greater tree vigor. Soil samples of 250 cc were processed using a modified sieving-misting extraction method and the nematode numbers were counted and species determined.

Tree vigor from the sampled area was rated on a scale from 1 to 10. Soil texture was rated in the field, and later a soil survey map was used to determine the soil type. Other physical or biological problems such as soil compaction or *Verticillium* wilt were also noted. Information on planting date, preplanting cropping history, and planted varieties was obtained from each grower.

Of 42 orchards (83 soil samples), only one had a high nematode population, consisting of more than 100 each of dagger nematode and root lesion nematode per sample. In two orchards, these two nematodes were detected at population levels greater than 20 per sample. In the remaining 39, very few or no plant parasitic nematodes were detected. Pin nematode (*Paratylenchus hamatus*), root lesion nematode (*Pratylenchus neglectus*), dagger nematode (*Xiphinema americanum*), and a species of root knot nematode (*Meloidogyne* sp.), were present in 19, 12, 8, and 3 orchards, respectively. A single root lesion nematode species (*Pratylenchus neglectus*), was consistently found in the orchards, but no other root lesion species common to other perennial crops were detected. *Xiphinema americanum* was the only dagger nematode found. In the 21 orchards exhibiting *Verticillium* wilt, no nematode species was commonly associated with wilt incidence.

Numbers of root knot nematodes were conspicuously low, despite environmental and cropping histories conducive to their establishment in many of the orchards. Root knot nematodes were detected in relatively few samples from coarse-textured soils and in none from finer soils (see table).

Four of the soil samples were from sandy or loamy sand soils, but only one sample showed low populations of root knot and pin nematodes. The 43 soil samples from sandy loam or fine sandy loam soils commonly included dagger,

Soil textural preferences of nematodes detected in 83 soil samples

Nematode	No. samples containing nematodes	
	Sand, loamy sand, sandy loam*	Loam, clay loam, clay†
Pin	12	10
Root lesion	8	9
Dagger	4	9
Root knot	4	0
Others	6	7
None detected	17	13

* 47 soil samples.

† 36 soil samples.

pin, and root lesion nematodes. These nematodes were most prevalent among the plantings 15 years of age or older.

Loam or gravelly loam soils accounted for 17 soil samples. Populations were similar to those in the coarser textured soils, except that a species of stem and bulb nematode (*Ditylenchus* sp.) and a *Tylenchus* sp. were also found at low population levels in three locations near McFarland. Stubby root nematode, *Paratrichodorus minor*, was also found at four sampling sites.

In 19 clay or clay loam soils sampled, nematode populations were the same as in the coarse-textured soils. The only high population consisted of dagger and root lesion nematodes at one location in a clay soil, which was coincidentally associated with poor tree growth.

The pin nematode is commonly present among the roots of a wide range of perennial crops in California and elsewhere. There have been demonstrations of damage to celery and mint. Previous work with this nematode on grape (*Vitis vinifera* 'Thompson Seedless') has shown the highest nematode populations on the most vigorous and high-yielding vines. The root lesion nematode is a common parasite of grass roots, and in this study, its presence was associated with the sod area between trees.

Dagger nematode was found in 19 percent of the sampled orchards. Because of the taxonomic complexity of this species and its ability to transmit specific soil-borne viruses, it is regarded as a potential problem to the pistachio industry if any such viruses should develop in this crop. Pistachio is a good host of dagger nematode and should be included in future pathogenicity tests. It was, however, not generally found in association with low tree vigor.

Plant parasitic nematodes do not now appear to present a serious pest problem in California pistachio production.

Michael V. McKenry is Associate Nematologist, and Joseph O. Kretsch is Staff Research Associate, Department of Nematology, University of California, Riverside, stationed at Kearney Agricultural Center, Parlier.