



Citrus Nematode and Their Management

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Plant parasitic nematodes are microscopic, unsegmented and roundworms that live in soil and plant tissues. They are distinguished from other nematodes by a mouth stylet, typically a syringe-like structure adapted for feeding on living cells.

Citrus Nematode (*Tylenchulus semipenetrans*) is the only major nematode pathogen in California citrus. Originally from Asia, it spread worldwide with infested planting stock. The host range of the predominant biotype includes also grape, lilac, persimmon, olive, and trifoliolate orange.

Its life cycle includes an egg, four juvenile stages, and an adult stage. The first-stage and second-stage juvenile (J2) develop within the egg from which the latter one hatches. Approximately a quarter of the J2 develop into males that do not feed. They remain long and slender throughout their development and do not penetrate the roots. The other J2 first feed on the outside of young feeder roots for 2 to 3 weeks. They then burrow deep inside the root cortex while the back end remains outside of the root. Relatively few J2 succeed at entering the root considering their abundance in the rhizosphere. After another two moults of the young females penetrate further into the cortex. They initiate a feeding site with several nurse cells. At maturity, the back end of the now sedentary female swells and extends from the root surface. Meanwhile, its head remains at the nurse cells inside the root.

Reproduction occurs both sexually and asexually. Each female can produce about 100 eggs that are embedded in a protective gelatinous matrix. The female life cycle from egg to egg ranges from four to eight weeks. The highest numbers of nematodes are typically found in late spring and late autumn following the citrus root flushes. Hatch, feeding, growth, and reproduction is limited between 20 °C and 30 °C. Second-stage juveniles are the persistent stage that can survive for a year or more in field soil.

Symptoms and Damage

Damage caused by citrus nematodes is called citrus slow decline, which refers to the gradual starvation and consequent deterioration of the tree. Aboveground symptoms include reductions in leaf and fruit size, as well as leaf yellowing, curling, and twig dieback that are caused by poor root development and feeder root decay. Feeder roots that are heavily infested with mature citrus nematode females typically appear darker and thicker than those without the parasites. This impression is caused by soil particles encrusted with the egg sack gel.

Monitoring

Before planting or replanting a citrus orchard, obtain a professional soil analysis; the analysis will help you determine the potential for nematode damage and plan a management strategy. In an established orchard, a soil analysis will confirm visible symptoms that may be present.

Management practices

❖ Cultural Control

- Sanitation is the most important and economical means to avoid plant-parasitic nematode problems and for ensuring long-term citrus productivity.
- Use certified nematode-free planting stock, citrus nematode-resistant rootstocks, and nematode-free planting sites.
- Prevent citrus nematode infestation by contaminated run-off or irrigation water.
- Rotate with annual crops for 1 to 3 years before replanting citrus to reduce the number of citrus nematodes.

❖ Chemical Control

- If the site was previously infested with citrus nematodes, consider applying a preplant fumigation to reduce their numbers, even if a tolerant rootstock is used. Trees planted on fumigated orchard sites are generally known to have improved growth and yields compared to those on nonfumigated sites. Example – Metham sodium, 1,3 Dichloropropen.
- Postplant nematicides- Fluopyram
- Fluopyram is a non-fumigant nematicide that can effectively control nematodes.