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PRE- AND POST-PLANT REMEDIES FOR NEMATODE INFESTATIONS OF WALNUT ORCHARDS

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Objectives

1. Evaluate pre-plant non-fumigant and large-volume materials in walnut establishment sites.
2. Test two registered post-plant materials at label rates.

Background

Walnut orchards are attacked by plant-parasitic nematodes, root lesion nematode (*Pratylenchus vulnus*) being one of the key soil-borne pests. This microscopic roundworm is found in approximately 85% of California walnut orchards. When planting a new orchard, even a few nematodes in the soil can cause damage to walnut. These nematodes occur deep in the soil profile, and large numbers are frequently found down to 5-foot depth. Reducing the nematode numbers below where they can cause damage in such huge soil volume is difficult. For decades, the versatile and highly effective methyl bromide was used to reduce nematode numbers and other soil-borne problems before planting of walnut. After the final phase-out of methyl bromide for wide-scale commercial applications in 2005, pre-plant soil treatment with the soil fumigant 1,3-dichloropropene (1,3-D) or its mixtures with chloropicrin are used for soil preparation. The latter is often added to the fumigant mix when the orchard is to follow a prior walnut orchard to reduce the so-called replant disorder. 1,3-D has lower gas pressure than methyl bromide making soil preparation including the moisture content critical for successful treatment efficacy. Human health and environmental concerns limit the use amounts of 1,3-D by township caps. Alternative pre-plant soil treatment options are urgently needed to add grower choices of predictable treatment options.

High levels of nematode-reducing efficacy necessary to reduce nematodes to levels that the soil-dwelling parasites will not damage walnut are difficult to attain. In addition, low remaining populations of the nematodes can soar quickly to damaging levels once their favorable host walnut is established. This challenge calls for post-plant application tools. In a prior related project of the PI, several newer chemicals were tested for utility in perennials. Pre-plant application of three materials was followed by reduced nematode population densities to the required soil depths. In this current project, pre-plant soil treatment trials are conducted at the Kearney Agricultural Research and Extension Center and on two commercial farms on sandy loam and clay loam soil. Three post-plant treatment trials are conducted in different soil types on commercial farms.

Results & Discussion

In pre-plant treatment trials, Salibro, Velum One (both low-volume), and Dominus were applied via a drip irrigation system to bare ground that had been fully prepared for orchard planting. The materials were delivered to the soil in 6 acre-inch of water to distribute them to 5-foot depth in the soil profile. The high-volume material Dominus was tarped during this process with totally impermeable film (TIF). In one trial at the Kearney Agricultural Research and Extension Center (KARE) established in October 2018, 'Solano' grafted on the rootstock 'Vlach' was maintained with additional post-plant treatments in 2020. In 2020, trees in the Dominus treatment plus a post-plant treatment with Salibro in spring 2020 had much improved growth compared to the non-treated control and other pre-plant treatments. Tree growth was comparable to a pre-plant treatment with Telone EC. Such promising data need to be corroborated before recommendations can be deduced.

For this purpose, more trials included other growth environments and soil types. In September 2019, a second trial had been initiated at Winters, CA, and treatments included the two non-fumigant nematicides, Dominus, and treatment with anaerobic soil disinfestation (ASD). It was planted to walnut rootstocks RX1 and VX211 in spring 2020 and field-grafted after that. Two pre-plant treatment trials were initiated in 2020: one at Escalon, CA that includes the chemical treatments plus modified and original ASD treatments, and one at KARE where modified application patterns for ASD and Dominus applications are trialed. Data on ASD and modified application techniques are forthcoming.

In parallel to the pre-plant treatment projects, post-plant treatments focused on Velum One and Movento; both products are registered for use in nut crops in California. Post-plant treatment with Movento following treatment recommendations increased nut yields after the third year of application. Experiments with these products continued in Tulare County (spring application, start: 2018), Glenn County (fall application of soil drench, start: 2018; completed in 2020), and Yolo County (spring and fall applications, start: 2019). Data illustrated that treatment effects were more likely to be significant after repeated growth periods.