PLANTPRO 45™ as an Alternative for Nematode Control in Chilean Grape Crops

Patricia Fuentes-Bórquez[1,3], Nancy Kokalis-Burelle[2], William Basinger[1], Andres Cosio[4], and Claudio Carter[4]

[1] Ajay North America, LLC, Powder Springs, GA
[2] USDA, ARS Horticultural Research Lab, Ft. Pierce, FL
[3] SQM Chemicals, Chile
[4] Dole, Chile

Reductions in the allowed use of organophosphate nematicides, combined with the scheduled phase-out of methyl bromide in the near future has stimulated a great deal of research to find new economic and technically viable alternatives for use in both developed and developing countries. PLANTPRO 45™, a new reduced risk alternative nematicide, is compared at three rates against the organophosphate fenamiphos for controlling post-harvest (phase I) nematode populations in grape crops in three regions of Chile. In phase II of this study, applications will be made at the time of root-activation and shoot growth. Chile ranks tenth in worldwide grape production, and first in total Chilean exports for fresh consumption with a 40.3 % exported volume; 53 % being exported to the U.S. during November through May.

Field Trial Locations: Three Dole commercial grape cropping fields in Chile were chosen: 1.- Huelquén, Paine (Metropolitan Region), 2.- Quilapilún, Colina (Metropolitan Region), and 3.- Punitaqui, Punitaqui (IV Region). All the fields have a medium to high plant parasitic nematodes population. The species of interest that were studied are: *Meloidogyne, Xiphinema, Helicotylenchus, Paratylenchus, Pratylenchus, Criconemella* and *Tylenchorhynchus.* The nematode genera studied are typically controlled by two annual fenamiphos applications (made to the soil via drip irrigation) and amimal admendments. All three study sites have loamy to clay soils of shallow to moderate depth.

Treatments: At each of the three locations five separate treatments were made: **1**.- Plantpro 45 at 22.8 Kg a.i./hectare (60 ppm a.i. in drip water), **2**.- Plantpro 45 at 30.5 Kg a.i./hectare (80 ppm a.i. in drip water), **3**.- Plantpro 45 at 45.7 Kg a.i./hectare (120 ppm a.i. in drip water), **4**.- Fenamiphos (Nemacur 400 EC) at 10 L/ha, and **5**.- Untreated Control.

Experimental Design: A randomized complete block design with five replications per treatment was used at each of the three locations. Thirty-five plants, on a linear repetition, spaced 3 m (9.8 ft), 3.5 m (11.5 ft), and 2 m (6.6 ft) in the row, and rows spaced at 3 m, 3.5 m, and 3 m at the Huelquén, Quilapilún, and Punitaqui sites, respectively. Grape varieties used in the trials: Red Globe and Crimson Seedless. Data from each experimental plot was subjected to analysis of variance and a mean separation.

Treatment Application Methodology: The PLANTPRO45™ treatments were delivered through a single, 16 mm (0.64") diameter, fast drip line. The drip emitters were spaced at

1 m (3.28 ft) apart and 0.5 m (1.64 ft) in the Metropolitan Regions and IV Region site, respectively. The delivery flow per emitter was 4 L/hr (0.18 gal/min). Each of the PLANTPRO45^{TM} treatments was applied with 38 mm (1.5 “) of irrigation water per treated hectare in order to penetrate ~ 45 cm (1.5 ft) into the soil profile. Tractor drawn pumping equipment, 1,500 L capacity with hydraulic agitation, was used to prepare the 1,000 L of Plantpro 45 pre-mix for slug injection into the irrigation system. Before injecting the 1,000 L PP45 pre-mix, the drip lines were drained to ensure the complete line filling with the Plantpro 45 solution. The system pressure was maintained at a constant 12 bar to ensure a uniform distribution onto the planting row. When all pre-mix solution was injected into the irrigation system, the remaining water was put out through the main water feed line connected to the irrigation system (in order to reach the prescribed 38 mm). Each Plantpro 45 treatment was followed by 5 mm (0.2”) of straight irrigation water to flush out the drip irrigation system.

Results:

1.- Huelquén site, 21 days after the treatment application, Plantpro 45 at 60 and 120 ppm a.i. concentration decreased the total nematodes plant parasitic population by 38% and 13% with respect untreated control; whilst Plantpro 45 at 80 ppm a.i. concentration and Nemacur 400EC increased the soil total nematodes population. Plantpro 45 decreased the Dagger nematode (*Xiphinema americanum* and *X. index)* populations by 60 to 100% and 22% to 30%, respectively. Nemacur increased the dagger nematode population.

2.- Quilapilún Site: Plantpro 45 at 60, 80 and 120 ppm a.i. concentration, and Nemacur gave respective decreases in the total nematode populations of 51%, 9%, 63%, and 51% relative to the untreated control. Specifically, *Xiphinema index* populations were respectively reduced by 84%, 92%, and 84% in the treatments where Plantpro 45 was applied at 60 ppm a.i. concentration, 120 ppm a.i. concentration, and Nemacur at the rate of 10L/ha.

3.- Punitaqui Site: Plantpro 45 applied at 60 ppm a.i. concentration resulted in a 70% decreased in the total nematode population relative to the untreated control, in contrast Nemacur 400EC yielded a mere 30% reduction. The lowest applied rate of Plantpro 45 decreased the *Xiphinema* and *Meloidogyne* specie populations by 80% and 57% respectively.

Conclusions: PLANTPRO 45^{TM} , in phase I field trials, has demonstrated the ability to control a wide range of pathogenic nematodes to the same degree that they are typically controlled by organophosphates and or methyl bromide. The outcomes of these trials will be more apparent in Phase II where another application will be made and grape crop yields and quality will be tabulated.