PLANTPRO 45: AN OVERVIEW ON SOILBORNE PATHOGEN AND WEED CONTROL

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As reductions in the production and use of methyl bromide continue, research has focused on implementation of new alternatives for the control of soilborne pests. Two years of greenhouse and field trials on Plantpro 45, a low-risk iodine-based compound, has indicated potential for control of root-knot and sting nematodes, some soilborne fungal and bacterial pathogens, seedborne fungal pathogens, and important weed species.

Use of Plantpro for nematode control has resulted in significant reductions in root-knot nematode (*Meloidogyne incognita*) damage on tomato at multiple field locations in Florida (Adams et al., 2000; Kokalis-Burelle and Fuentes-Borquez, 2000; Kokalis-Burelle et al. 2000). Field trials conducted in cooperation with the IR-4 methyl bromide alternatives research program on strawberry in Florida indicated that Plantpro 45 is an effective nematicide for controlling soil populations of sting nematode (*Belonolaimus* spp.) (Figure 1).

Fungicidal and bacteriocidal effects of Plantpro were also demonstrated in field trials at several locations in Florida. Plantpro 45 provided significant control of Fusarium crown rot (*Fusarium oxyporum* f.sp. *radicis lycopersicil* – FORL) and bacterial wilt (*Ralstonia solanacearum*) of tomato in naturally infested fields. Under greenhouse conditions, soil drench with Plantpro 45 at 80 ppm a.i. followed by planting 21 days later and a foliar application at 80 ppm one week after planting increased root and shoot weight, and improved root condition of tomato when grown in field soil naturally infested with FORL (Figure 2).

Treatments with Plantpro 45 have resulted in yields comparable to methyl bromide in a number of tomato field trials. When applied through drip irrigation in combination with other nematicides such as Fosthiozate 500 EC and herbicides such as Devrinol in strawberry field trials, it has enhanced shoot and root growth (Figure 3). A new formulation of Plantpro 20 EC, which is also a low-risk and more concentrated iodine-based compound similar to Plantpro 45, has also been shown to improve plant growth of field grown tomatoes when applied through drip irrigation.

As a seed treatment, Plantpro 45 controls *Fusarium moniliforme* in maize seed (Yates et al., 2000) and reduces infestation of basil seed with *Fusarium oxpysporum* f.sp. *basilici* – FOB as well as incidence of Fusarium wilt of basil

caused by FOB. Seed treatment of basil with Plantpro 45 was found to also enhances germination, increases plant height and plant weight, and leaf area of basil seedlings in repeated experiments (Adams and Kokalis-Burelle, 2000). Multiple greenhouse experiments on weed infestation levels in naturally weed infested field soil revealed that Plantpro 45 has herbicidal potential for control of one of Florida's major herbaceous weed species in vegetable crops commonly known as purslane (*Portulaca oleracea*) (Adams and Kokalis-Burelle, 2001). Additional experimental results on the herbicidal effects of Plantpro 45 have confirmed significant reductions in populations of nightshade, purple and yellow nutsedge, and crabgrass (Figure 4). Results also showed that high foliar applications of Plantpro 45 on emerged weed species, followed by rototilling prior to planting, provided effective control of weeds without phytotoxic affects on tomato when an interval of 21 days was implemented before planting and adequate soil moisture was maintained between application and planting.

Analysis of the nematode and microbial populations in soil and plant tissue after soil treatment with Plantpro 45 has indicated an increase in non-parasitic nematode populations (Kokalis-Burelle et al., 2000) and functional groups of bacteria such as fluorescent pseudomonads and iron-chelating (siderophore-producing) bacteria. These organisms have been shown to contribute to plant growth promotion and biological control of a number of soilborne pathogens (Kloepper et al., 1980; Scher et al., 1982; Sneh et al. 1984).

In conclusion, as a pre-plant alternative to methyl bromide, Plantpro 45 has the potential to control multiple soilborne pathogens in several important crops as well as enhance plant growth and yield, if appropriate cultural and application practices are diligently implemented prior to planting. Plantpro 45's enhancement of beneficial soil microorganisms may contribute to the nematode, fungal and bacterial pathogen control observed. This product also has the potential to be used as a seed treatment to reduce seed transmitted fungal pathogens and aflatoxigenic fungal species and as a herbicide for the control of multiple weed species. Additional research on application methodology and cultural practices, such as planting interval and water requirements, needs to be conducted in order to realize the full potential of this versatile product.

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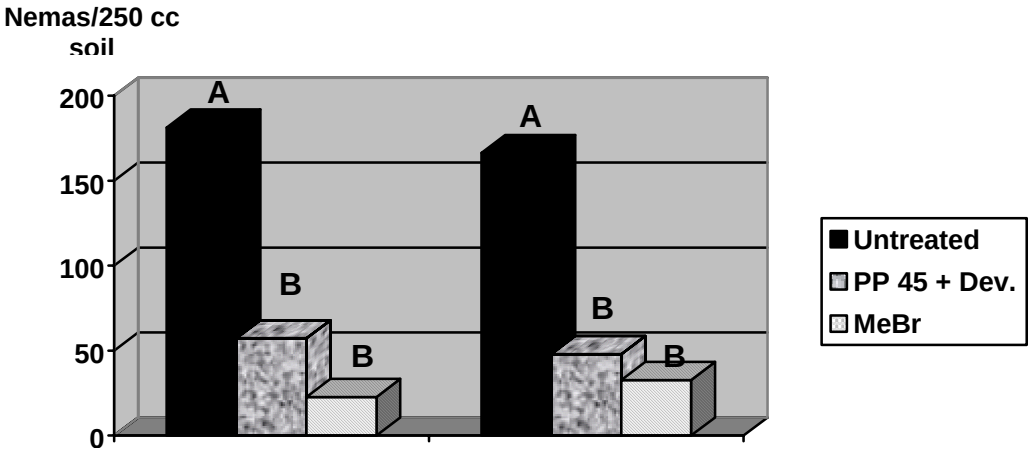

Figure 1. Effect of Plantpro 45 on soil populations of sting nematode at 35 DAP in two locations under strawberry production. IR-4 Field Trials, Fall 2000.

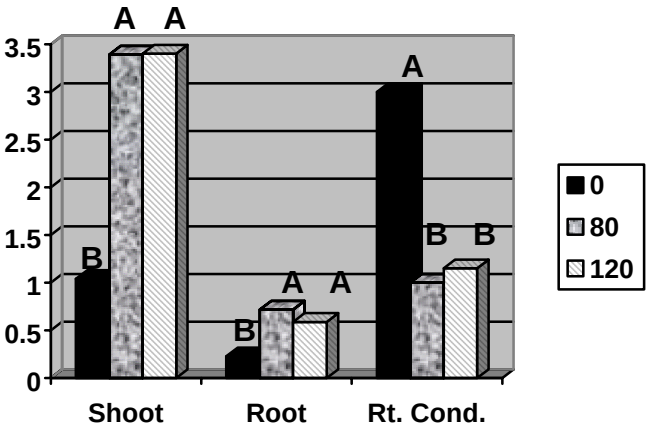

Figure 2. Effect of Foliar and Soil Drench Applied Plantpro 45 on dry shoot and root weight (g) and root condition (1 = healthy to 5 = poor) of tomato grown in field soil under greenhouse conditions.

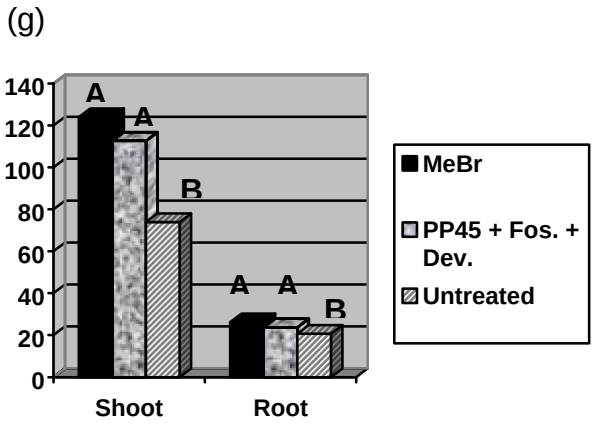

Figure 3. Mean dry shoot and root weights of strawberry grown under field conditions. IR-4 Field Trials, Dover, FL, Fall 2000.

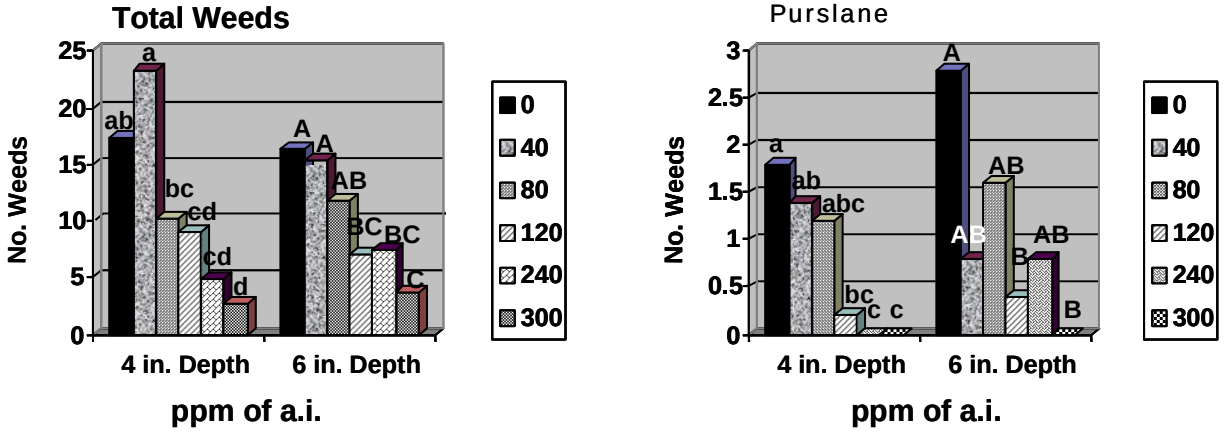

Figure 4. Effect of Plantpro 45 on high densities of purslane grown at different depths and total weed populations in field soil infested with crabgrass, nutsedge, nightshade, and purslane.