PLANT RESISTANCE and SOIL AMENDMENTS IN FLORIDA TOMATO and PEPPER

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The phaseout of methyl bromide has stimulated a considerable amount of nematological research on an international and national basis, as well as within the state of Florida. Florida research has encompassed evaluations of both chemical and or nonchemical pest control tactics at multiple locations around the state including commercial large scale field trials and small plot experiments at university research centers. The various tactics being researched include use of nematode resistant pepper and tomato varieties, cover crops, organic amendments, soil solarization, biorational nematode suppressant compounds, and alternative fumigant nematicides. Inclusive to these research efforts are considerations of pest control efficacy, crop response, cost, availability, and equipment requirements. The objective of this paper is to highlight the results of some of the nonchemical field trials performed in south Florida during 1997-98.

USE of NEMATODE RESISTANT VARIETIES: During Fall 1996, a series of five small plot field experiments were initiated to evaluate the new root-knot nematode resistant tomato variety cv. Sanibel, and to compare the resistance and plant yield response of this variety with a nematode susceptible variety, cv. Agriset 761. The study was repeated five times to determine whether resistance could in fact be broken by repeatedly selecting for soil populations of the root-knot nematode which could become able to reproduce and cause significant yield loss to this new nematode resistant variety. In general, these studies simply show that a naturally occuring virulent population of *M. incognita* was already present in soil, since some individuals of which were able to parasitize and reproduce on the resistant gene bearing Sanibel . Even though reproduction was not assessed for all experiments, final harvest soil population densities of *M. incognita* remained low within Sanibel, relative to the levels observed in susceptible Agriset, indicating an initial high level of resistance. It was not until the conclusion of the fifth planting cycle of fall 1998, did final harvest soil populations of *M. incognita* increase to higher levels in the resistant Sanibel compared to Agriset. At this same time (fall 1998), root gall severity and relative yield losses were also higher with Sanibel than Agriset (Fig. 1). These studies also show that irrespective of nematode reproduction, a nematode resistant cultivar is not immune from incurring significant crop damage. During the first three planting cycles (Fall 1996 through Fall 1997), Sanibel yield losses were on average 20% less than that of susceptible Agriset, indicating an apparent higher degree of plant tolerance to nematode parasitism by *M. incognita*. This expression of plant tolerance dissappeared however during the final two cropping cycles in which Sanibel yield losses were on average 13% more than that of susceptible Agriset. Even with a resistant cultivar therefore, some consideration of preplant population levels of root-knot nematode in soil must be observed to minimize potential yield impacts. Given tomato yield reductions of 30 to 40% at the highest soil population levels, combined efforts to manage *M. incognita*

to low levels must still be considered prior to planting. These studies have also demonstrated that use of a nematode resistant variety is not in itself a stand alone replacement for methyl bromide soil fumigation, nor can the resistance be expected to last if some attempt is not made to preserve the resistance by alternating susceptible and resistance crop varieties in consecutive planting cycles.

Beginning Fall 1998, a series of two small plot field experiments were initiated to evaluate two new root-knot nematode resistant pepper cultivars, cv. Carolina Wonder and Charleston Belle, and to compare the resistance and plant yield response of these cultivars with a nematode susceptible cultivar, cv. Camelot. In general, the results of the two studies failed to show any significant (P=0.05) differences in pepper yield losses between resistant and susceptible cultivars when grown in *M. incognita* infested soil (Fig. 2.). Average yield losses of 52% and 86% were observed for fall 1998 and spring 1999 trials, respectively. No differences (P=0.05) in root gall severity caused by *M. incognita* was observed between pepper varieties. These studies demonstrate again that a nematode resistant cultivar is not immune from incurring significant crop damage and that use of a nematode resistant variety is not in itself a stand alone replacement for methyl bromide soil fumigation.

USE of SOIL AMENDMENTS: Beggining Spring 1997, a series of four small plot experiments were initiated to assess the potential value of a single source of composted municipal waste (CMW) to suppress soil populations of the southern root-knot nematode (*Meloidogyne incognita*) and to improve or maintain tomato yield in the presence of damaging soil populations of the pathogen. The CMW, obtained from Palm Beach County, FL consisting of yard trimmings and biosolids, was applied at broadcast incorporated rates of 0, 15, 30, 60, 90, and 120 tons per acre. With the different amendment rates, tomatoes were then grown in either nematode free or nematode infested soil. In general, the results of these four studies showed the potential for significant increases in tomato yield with amendment rate, particularly in the first tomato crop following CMW application (Fig. 3.). In some instances, the yield of tomato with the incorporated compost was near double (196%) the yield of the unamended control. The principal effect of the CMW was however not direct suppression of *M. incognita* but an apparent increase in water and nutrient availability which resulted in improved tomato plant growth and yield. In addition to being nonnematicidal, use of the composted municipal solid waste did not enhance the ability of tomato plants to tolerate root infection by root-knot nematodes. Tomato yields were most always reduced by a constant amount by nematodes. In general as plant and root system size increased with amendment rate, so then did final harvest soil population densities of *M. incognita.* In the fall 1997 test, the effect of the amendment on nematode population buildup was so pronounced that tomato yields were unaffected and actually decreased with amendment rate. In general, the larger the plant, the more the food and the higher the end of season nematode population density. As has been reported in other recent soil amendment studies in Florida, use of the Palm Beach CMW proved not to be an effective alternative to methyl bromide soil fumigation, and unless nematodes come under biocontrol, may in fact increase mangement difficulty of soil nematode populations.

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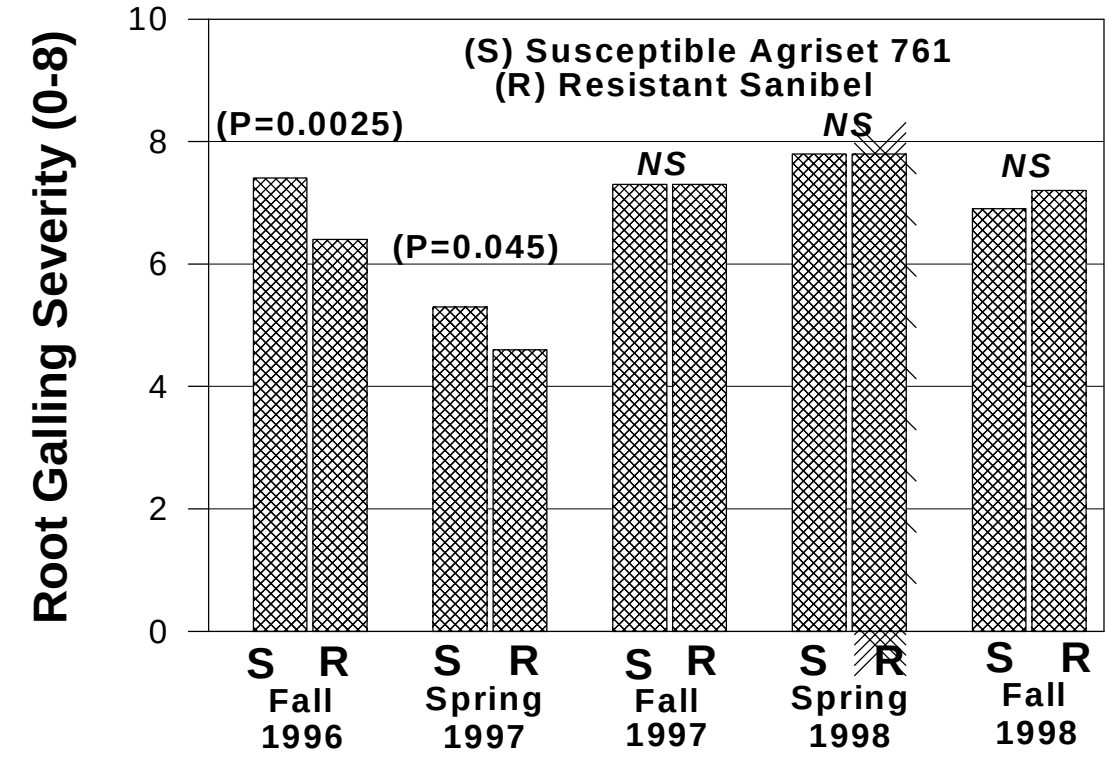
Fig. 1. Responses in root galling and potential yield loss of root-knot nematode susceptible (Agriset 761) and resistant (Sanibel) tomato cultivars in each of five concurrent field trials from fall 1996 through fall 1998. UF/CREC, Lake Alfred, FL



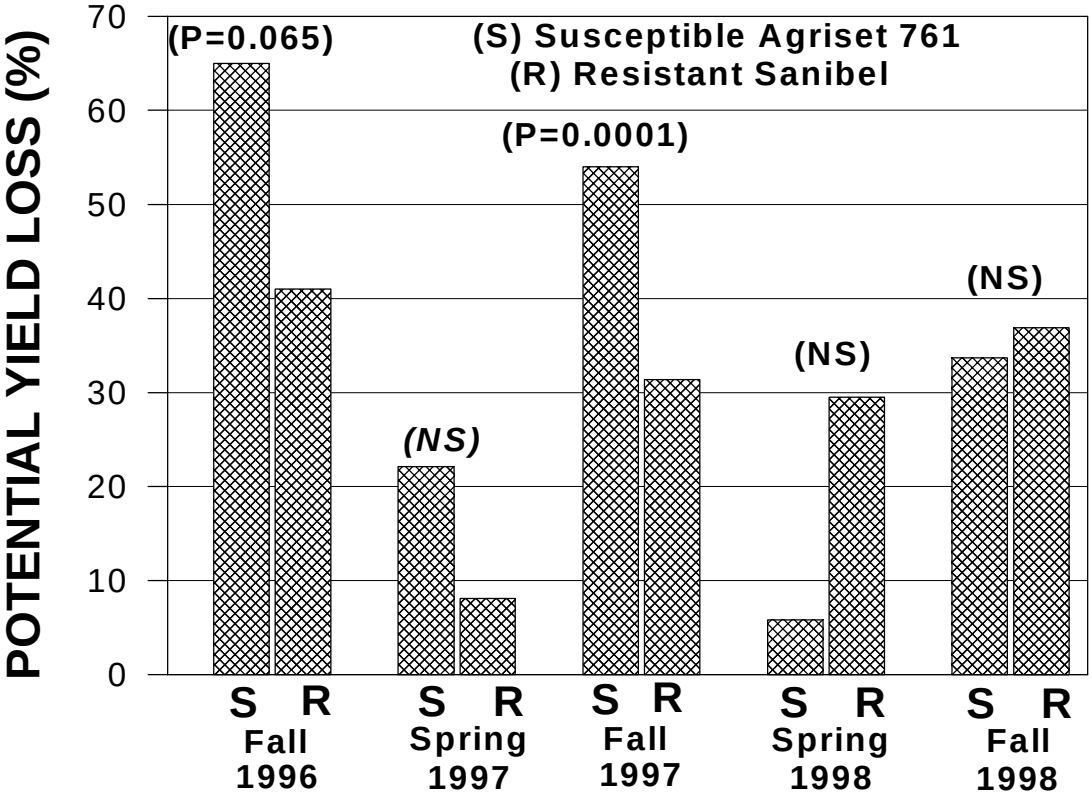


Figure 2 . Yield of susceptible (S) and resistant (R) bell pepper cultivars grown in field microplots with (+nema) and without (-nema) the southern root-knot nematode, *Meloidogyne incognita*, during fall 1998 and spring 1999 at UF/CREC, Lake Alfred, FL.

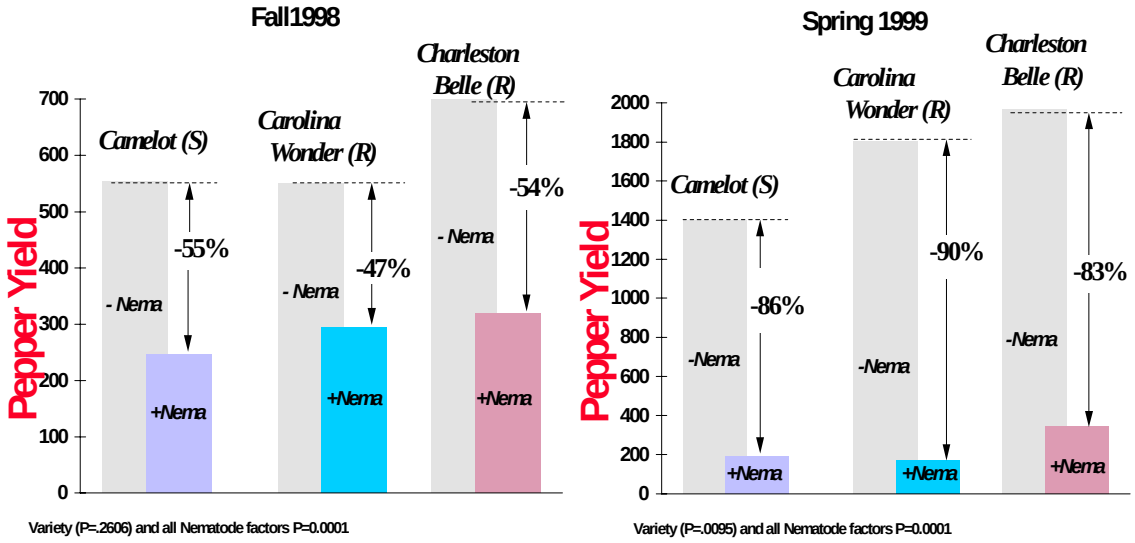


Figure 3. Responses in tomato yields grown in amended field microplots with (+nema) and without (-nema) the southern root-knot nematode, *Meloidogyne incognita.*