Management of Nematodes and Other Soilborne Pests in Floriculture Production Systems

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PROJECT OBJECTIVES:

1. Compare promising chemical and nonchemical methods for efficacy in the field against nematodes, weeds, soilborne diseases, and crop performance.
2. Expand knowledge and information base on susceptibility or resistance of floral crops and cultivars to nematodes and other pests.
3. Improve performance of nonchemical practices for managing nematodes and other soilborne pests.
4. As resources permit, conduct research on novel approaches to manipulating soil environments so that they are more suppressive to plant-parasitic nematodes.

ACCOMPLISHMENTS:

Experiments evaluating the susceptibility of selected flower cultivars to *Meloidogyne incognita* (race 2) and *M. javanica* were recently completed and published. Snapdragon and nasturtium were susceptible and supported high population levels of both nematode species, but the marigold, zinnia, salvia, and carnation cultivars evaluated were poor hosts. Delphinium showed light galling with intermediate nematode population levels, but in general was significantly less susceptible than snapdragon and often similar to the resistant flower species. Flower growers typically produce several different crop species, and may have the opportunity to rotate some of these, such as snapdragon and delphinium. Florida growers do not typically produce all these species as cut flower crops, but are interested in using marigold for nematode suppression. A summary of resistance and susceptibility of marigold (*Tagetes* spp.) cultivars to nematodes has been completed and published on-line.

Work has been published comparing the relative pathogenicity of *Pythium aphanidermatum* and *Fusarium oxysporum* alone and in combination on snapdragon (*Antirrhinum majus*). Florida isolates of *P. aphanidermatum* were consistently pathogenic to snapdragon, causing root and crown rot, and reduced plant height, root weight, and numbers of flowers. *Fusarium oxysporum* was not pathogenic. *Pythium* spp. are common and endemic in field sites. Therefore a successful methyl bromide alternative must involve management of *Pythium* spp. as well as nematodes and weeds, since all of these organisms can occur together in field production sites.

Several field and laboratory experiments have been aimed at optimizing the efficacy of soil solarization for management of nematodes and other soilborne pests. A demonstration test with solarization in a grower's field showed that fumigation with methyl bromide was more effective in managing several kinds of summer weeds, but solarization was more effective against white clover (*Trifolium repens*), a winter weed of particular concern in the flower crop. Recently published work revealed that eggs and juveniles of *Meloidogyne incognita* can be killed over time even at temperatures of only 40-42°C, substantially lower than the temperatures of >45°C typically expected under solarization. However, lethal effects at reduced temperatures required prolonged exposure to those temperatures, so the recommendation to keep solarization films in place for

6 weeks remains unchanged. Field trials with snapdragon were recently completed with the objective of comparing solarization and reduced-risk pesticides to a methyl bromide standard, in a site that was heavily infested with *Pythium* spp., *Meloidogyne incognita*, and weeds. Solarization was not as effective as methyl bromide for reducing pest levels and improving flower yields. Integrating solarization with Biophos (a phosphonate /phosphate product) or Kodiak (a rhizobacteria product) did not show significant improvement over solarization alone. Managing a severe nematode-disease complex over the long growing season needed for snapdragon is challenging due to nematode resurgence later in the growing season. Another study was conducted to compare the performance of different kinds of plastic films for use in solarization. Plastic films differed in their ability to manage nutsedge (*Cyperus* spp.) and in durability in the field. Optimum performance was achieved with Polydak solarization film, currently produced in Israel. Selection of the most effective plastic film can help to further optimize the use of solarization as a soilborne pest management practice for growers.

TECHNOLOGY TRANSFER/IMPACT:
Work on susceptibility of flower species to nematodes has been presented in meetings and publications. Results on the relative susceptibility and resistance of flower species and cultivars have been presented at the Florida State Horticultural Society meeting in 2008 and recently published (Om, N., R. McSorley, and J.J. Frederick. 2008. Response of cut flowers and bedding plants to root-knot nematodes. Proc. Fla. State Hort. Soc. 121:370-373). The resistance of marigold cultivars to nematodes has been summarized and published on-line on the University of Florida IFAS Extension website (http://edis.ifas.ufl.edu/NG045). This information can be easily accessed and is now readily available to growers.

Soil solarization is a promising alternative to fumigants for the management of nematodes, weeds, and diseases. Growers are interested in adopting this technique, and a demonstration test in a grower's field indicated that solarization was more effective than methyl bromide in managing white clover in a winter flower crop. Results of work with solarization have been presented at the Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions in 2006, 2007, and 2008, and published in the conference Proceedings each year. Tests comparing different types of plastic films for solarization have recently been completed and results will soon be published and available (Gill, H.K., R. McSorley, and D.D. Treadwell. 2009. Comparative performance of different plastic films for soil solarization and weed suppression. HortTechnology: in press). Soilborne diseases can be problematic for Florida growers following heavy rainfall events. Examination of isolates from a problem site indicated that a Pythium isolate was more pathogenic to snapdragon than a Fusarium isolate (Wang, K.-H., R. McSorley, and E.R. Malek. 2007. Pathogenicity of *Pythium aphanidermatum* and *Fusarium oxysporum* on snapdragon. Proc. Fla. State Hort. Soc. 120:365-369.). The use of solarizaton to manage severe complexes of root-knot nematodes and Pythium is an emphasis of recent work.

ADDITIONAL FUNDING/EXTERNAL SUPPORT: USDA, CSREES Methyl Bromide Transitions Program, grant no. 2006-51102-03566, "Short-term methyl bromide alternatives for the Florida Floriculture Industry", 2006-2010

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