WEED AND NEMATODE MANAGEMENT: SIMULTANEOUS CONSIDERATIONS

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In Florida, the most widely used and successful methods for managing plant parasitic nematodes has been soil fumigation, resistant cultivars, as well as other off-season cropping system practices such as fallow or cover cropping. Exclusion and sanitation practices, including weed management are also recommended for limiting nematode infestation. Recently, loss of weed control associated with alternatives to methyl bromide constitutes a major threat to nematode management in the future. For their successful use, most of these alternative methods require detailed knowledge of nematode and plant biology and ecology, as well as integration of several practices for maximum nematode suppression. This objectives of the studies described herein were to: 1) develop a catalog of principal weed pests commonly encountered in Florida field agriculture; 2) determine the host status of these principal weed species to that of root-knot nematode (Meloidogyne spp); and 3) demonstrate in grower field demonstration trial format, the impact of weed management on suppression of nematode population density in the post methyl bromide era of crop production in Florida..

During spring 2002, comprehensive surveys of seven commercial vegetable fields were conducted in east, southwest, and west-central Florida to evaluate the host status of various endemic weeds to root-knot nematode (*Meloidogyne* spp.). Fields were selected based on current nematode infestation levels. Weed plants, including roots, were collected from each field and returned to the laboratory where the weeds were identified and indexed for root gall severity utilizing a relative scale of 0-10 based on the proportion of the root system galled. Weed roots recovered from the field were carefully rinsed of soil, then stained with Phyloxine B to 'light-up' the egg masses of the root-knot nematode adhering to roots. The relative density of egg masses per gram of weed root was characterized according to an indexing scale of 0 = no egg masses; 1 = light or<10 per gram of root; 2 = moderate or 10-50 / gram root; 3 = heavy or 50-100 /gram root; and 4 =very heavy or >100 egg masses per gram of root. Simultaneous to the root staining operation, a subsample of appropriate weed roots were forwarded to the Florida Department of Agriculture and Consumer Services, Division of Plant Industry for extraction and recovery of adult females for DNA fingerprinting and root-knot nematode species identification. From this information, a catalog and weed management matrix which ranks the importance of specific weeds, and their control, for nematode management was developed.

Concurrent to the above studies, a grower field demonstration experiment, consisting of treatments which manipulated weed densities into broad categories of high, intermediate and low, was conducted to demonstrate the importance and direct linkage of weed density and or

their management to nematode population suppression. The three treatments included; 1) row middles of undisturbed soil; 2) row middles rotovated to a 4 to 5 inch soil depth; and 3) row middles which were covered with a polypropylene ground cover fabric to totally exclude subsequent weed growth.

RESULTS: In five of the seven field surveyed, *Meloidogyne incognita* was the exclusive root-knot nematode species recovered from weed roots. A new root-knot nematode species, *Meloidogyne mayagensis,* was recovered from one of the seven field sites. At one field site a mixed population of *M. incognita* and *M. javanica* was recovered from weed root samples.

Fifteen weeds commonly found in the sandy soils of south Florida were evaluated for host suitability to root-knot nematode. In general, nematode galling and egg production was observed on the roots of all fifteen weed species from at least one of the seven field survey sites (Table 1). With some weed species such as ragweed, cudweed or goosegrass, root-knot nematode galling and egg production was variable between survey site locations and was not correlated with differences in nematode species. Six of the fifteen weeds species supported only low levels of root-knot nematode reproduction at most sites. These included common ragweed, goosegrass, crabgrass, cudweed, and yellow nutsedge. Yellow nutsedge was not recovered from all field survey sites. Nematode galling and egg production was highest and most efficient on various pigweed and nightshade species, common purslane, clover, Sesbania, sand vetch, and carolina geranium. All of these weed species are common weeds of Florida agriculture. Although weed densities were not quantified at each field survey site, weed densities were typically very high, and in most cases, providing complete ground cover in areas between raised beds, the row middles.

End of season soil population densities of *M. incognita* were near undetectable in row middles covered with ground cover to provide season long exclusion of weed growth (Figure 1). Intermediate soil population densities of nematodes and of weeds were observed in the row middles of undisturbed soil. Highest nematode and weed densities were observed in the rotovated row middle treatment.

SUMMARY: In general these results demonstrate that the host range of root-knot nematode is very broad, and includes most of the common weed species which occur in the cultivated sandy soils of vegetable fields in south Florida. Surprisingly, none of the weed species evaluated in these studies was determined to be a nonhost to *Meloidogyne inconita.* In general, soil populations densities of *M. incognita* appeared to be directly correlated with weed density, ie., the level of weed root biomass in soil. Weeds which were allowed to grow and increase in numbers, particularly in-between mulch covered rows where the soil was rotovated to a depth of 4 to 5 inches , served to increase soil population densities of M. incognita to highest levels. From these studies it would appear that unmanaged weed growth serves to perpetuate a nematode problem from one cropping season to the next, and quite possibly, mandates the continued need for broad spectrum soil fumigants for nematode control. These results further suggest that nematodes cannot be effectively managed unless weeds are also effectively and simultaneously managed in the field. To account for potential interactions involving root-knot nematode, growers may well be advised to consider adjusting weed management strategies for vegetable fields infested with the root-knot nematode.

Table 1. Common weeds of Florida vegetables and their ability to support Root-knot nematode (Meloidogyne sp.) galling and egg mass development. Reproductive indexing scale consists of 0 = no egg masses; 1 = light or<10 per gram of root; 2 = moderate or 10-50 / gram root; 3 = heavy or 50-100 /gram root; and 4 =very heavy or >100 egg masses per gram of root.

Weed Species		Reproductive Index
Pigweed	Amaranthus sp.	Heavy – Very Heavy
Purslane	Portulaca oleracea	Very Heavy
Nightshade	Solanum sp.	Few – Very Heavy
Eclipta	Eclipta sp.	None – Few
Ragweed	Ambrosia artemisiifolia	Moderate - Heavy
Sweet Clover	Trifolium sp.	None – Few
Hemp Sesbania	Sesbania exaltata	Very Heavy
Sand Vetch	Vicia acutifolia	Very Heavy
Goosegrass	Eluesine indica	Very Heavy
Crabgrass	Digitaria sanuinalis	Few - Very Heavy
Carolina Geranium	Geranium carolinianum	None –Few
Cutleaf Evening Primrose	Oenothera lacinata	Moderate
Cudweed	Gnaphalium pensyvanicum	None -Moderate
Yellow Nutsedge	Cyperus esculentus	Few

Figure 1. Numbers of root-knot nematodes (Meloidogyne sp.) per 100 cc soil obtained from end of cropping season samples acquired from undisturbed, rotovated, or ground cloth covered row middles.