Journal of Nematology 41(1):2–4. 2009.

Reproduction of *Meloidogyne marylandi* and *M. incognita* on several Poaceae

T. R. Faske,[1] J. L. Starr[2]

Abstract: The susceptibility of 22 plant species to *Meloidogyne marylandi* and *M. incognita* was examined in three greenhouse experiments. Inoculum of *M. marylandi* was eggs from cultures maintained on *Zoysia matrella* "Cavalier" or *Cynodon dactylon* x *C. trasvaalensis* "Tifdwarf'. Inoculum of *M. incognita* was eggs from cultures maintained on *Solanum lycopersicum* 'Rutgers'. In each host test the inoculum density was 2,000 nematode eggs/pot. None of the three dicot species tested (*Gossypium hirsutum, Arachis hypogaea,* and *S. lycopersicum*) were hosts for *M. marylandi* but, as expected, *M. incognita* had high levels of reproduction on *G. hirsutum* and *S. lycopersicum. Meloidogyne marylandi* reproduced on all of the 19 grass species (Poaceae) tested but reproduction varied greatly ($P = 0.05$) among these hosts. The following grasses were identified for the first time as hosts for *M. marylandi*: *Buchloe dactyloides* (buffalograss), *Echinochloa colona* (jungle rice), *Eragostis curvula* (weeping lovegrass), *Paspalum dilatatum* (dallisgrass), *P. notatum* (bahiagrass), *Sorghastrum, nutans* (indiangrass), *Tripsacum dactyloides* (eastern gamagrass), and *Zoysia matrella* (zoysiagrass). No reproduction of *M. incognita* was observed on *B. dactyloides, Cyndon dactylon* (common bermudagrass), *E. curvula, P. vaginatum* (seashore paspalum), *S. nutans, T. dactyloides, Z. matrella* or *Z. japonica*. Reproduction of *M. incognita* was less than reproduction of *M. marylandi* on the other grass species, except for the *Zea mays* inbred line B73 on which *M. incognita* had greater reproduction than did *M. marylandi* ($P = 0.05$) and *Stenotaphrum secundatum* (St. Augustinegrass) on which *M. incognita* and *M. marylandi* had similar levels of reproduction.

Key words: dicots, grasses, *Meloidgyne marylandi*, *M. incognita*, hosts, Poaceae, root-knot nematode.

Root-knot nematodes are commonly found associated with turfgrasses in Texas. In most such cases the *Meloidogyne* species have not been identified. Exceptions were a population of *M. graminis* identified from *Cynodon dactylon* (common bermudagrass) (Orr and Golden, 1996) and four cases where the species was identified as *M. marylandi* (Starr et al., 2007). Since *M. marylandi* was described from a population originally thought to be *M. graminis*, it is possible that the population from 1966 was also *M. marylandi*. These observations suggest that *M. marylandi* is a common parasite of grasses in Texas.

Meloidogyne marylandi is one of the many *Meloidogyne* species for which there are few data on various aspects of its biology or its host range. All of the initial reports on this species are from different species of grass including *C. dactylon*, *Fescue* spp., and *Zoysia* spp. (Araki, 1992; Jepson and Golden, 1987; Kimmons et al., 1990). In the only study to date on host range, Oka et al. (2003) reported that *M. marylandi* reproduced well on six grass species or grain crops including *Triticum aestivum* (wheat), *Hordeum vulgare* (barley), and *Pennisetum glucum* (pearl millet). Several other grass species and grain crops were poor hosts, especially *Zea mays* (maize) and *Avena sativa* (oat). No dicot species tested (*Solanum lycopersicum, Cucumis sativus, Gossypium hirsutum,* or *Capsicum annuum*) were a favorable host for *M. marylandi* (Oka et al., 2003) Our objective was to confirm and expand on the host range data currently available for *M. marylandi* and to compare reproduction of *M. marylandi* on the test hosts to reproduction of *M. incognita*.

Materials and Methods

The isolate of *M. marylandi* used in these studies was collected from dwarf bermudagrass and cultured on that species and on zoysiagrass in a greenhouse using a soil mixture of sand and peat (6:1 v/v). No reproduction of *M. marylandi* was observed in several attempts to culture this species on tomato. The isolate of *M. incognita* (no. 98-1) was a composite of several populations, each collected from cotton and cultured on tomato. Nematode species identification was confirmed using esterase and malate dehydrogenase phenotypes (Esbenshade and Triantaphyllou, 1985; Oka et al. 2003). Inoculum was collected from infected host roots using NaOCl (Hussey and Barker, 1973).

Twenty-two plant species and cultivars were tested in three separate experiments (Table 1). In each experiment, freshly collected eggs were inoculated onto established seedlings growing in the sand-peat soil mix at 2- to 3-wk after emergence. Inoculum concentration was 2,000 eggs/pot. Pot size varied with plant species; 10-cm-diam. pots were used for the grass species and 15-cm-diam. pots were used for cotton, sorghum, tomato, and maize. There was a minimum of three single pot replications for each species tested. For the grass species there were three to five plants per pot whereas with the larger plants there was only one plant per pot. Each experiment was maintained in a greenhouse were ambient temperatures ranged from 22°C to 32°C.

Experiments were harvested 8 wk after inoculation and soil washed from the roots. Roots were blotted dry with paper towels, weighed, and a 5-g subsample was treated with 1.2% NaOCl to extract the eggs present. Eggs were extracted from the entire root system when the root mass was less than 5 g. Egg data were transformed to log (x + 1) prior to analysis to stabilize the variance but actual count data are reported. The eggs

Received for publication January 14, 2009.
[1]Department of Agribusiness, Agronomy, Horticulture, and Range Management, Tarleton State University, TSU Box T-0050, Stephenville, TX 76402.
[2]Department of Plant Pathology & Microbiology, Texas A&M University, College Station, TX 77843-2132.
E-mail: j-starr@tamu.edu
This paper was edited by Kris Lambert.

TABLE 1. Plant species tested for ability to support reproduction of *Meloidogyne marylandi* and *M. incognita*.

Species	Experiment No.	Common Name	Cultivar
Monocots			
Buchloe dactyloides	2	Buffalograss	
Cynodon dactylon	2	Common bermudagrass	
C. dactylon x C. transvaalensis	1	Dwarf bermudagrass	Tifdwarf
Echinochloa colona	1	Jungle rice	
Eragostis curvula	2	Weeping lovegrass	
Paspalum dilatatum	2	Dallisgrass	
P. notatum	2	Bahiagrass	
P. vaginatum	2	Seashore paspalum	
Oryza sativa	3	Lowland rice	Presidio
Sorghastrum nutans	2	Indiangrass	
Sorghum bicolor	3	Grain sorghum	SCO599-6
	3		ATx399 X RTx430
Stenotaphrum secundatum	2	St. Augustinegrass	
Tripsacum dactyloides	2	Eastern gamagrass	
Triticum aestivum	3	Wheat	Jackpot
Zea mays	3	Maize	B73
Zoysia matrella	2	Zoysiagrass	Diamond
	2	Zoysiagrass	Cavalier
Z. japonica	2	Zoysiagrass	Palisades
Dicots			
Arachis hypogaea	1	Peanut	Florunner
Gossyipum hirsutum	1	Upland cotton	DP90
Solanum lycopersicum	1	Tomato	Rutgers

were enumerated using a dissecting microscope. Effects of host and nematode species on eggs per g roots were subjected to analysis of variance using SPSS 16.0 (SPSS Inc, Chicago, IL) with mean separations, where appropriate, using Fisher's protected LSD.

Results and Discussion

In the first experiment, there was no detectible reproduction by *M. marylandi* on *G. hirsutum* or *A. hypogaea*. In contrast, *M. incognita* produced greater than 4,000 eggs/g roots on cotton with no detectible reproduction on peanut. On the *C. dactylon* x *C. tranvaalensis* hybrid and *Echinochloa colona*, *M. marylandi* produced similar numbers of eggs (ca 7,500 eggs/g roots for each host) whereas *M. incognita* produced 20,660 and 12,580 eggs/g roots, respectively, on these hosts.

In the second experiment, reproduction of *M. marylandi* and *M. incognita* was compared on 13 grass species or cultivars. Eggs of *M. marylandi* were recovered from the roots of each grass species, with a low of 150 eggs/g on *Sorghastrum nutans* and a high of 15,500 eggs/g on *Paspalum notatum* (Fig. 1). No reproduction of *M. incognita* was observed on seven grass species, with the highest reproduction observed on *Stentotaphrum secundatum* at 3,380 eggs/g roots (Fig. 1).

In the third experiment *M. marylandi* reproduced well on *Sorghum bicolor* accession 'SCO 599-6', *Oryza sativa*, and *Triticum aestivum*, but had low reproduction on the *S. bicolor* hybrid 'ATx399 x RTx 430' and on *Z. mays* (Fig. 2). *Meloidogyne incognita* reproduced well only on *Z. mays* in this experiment.

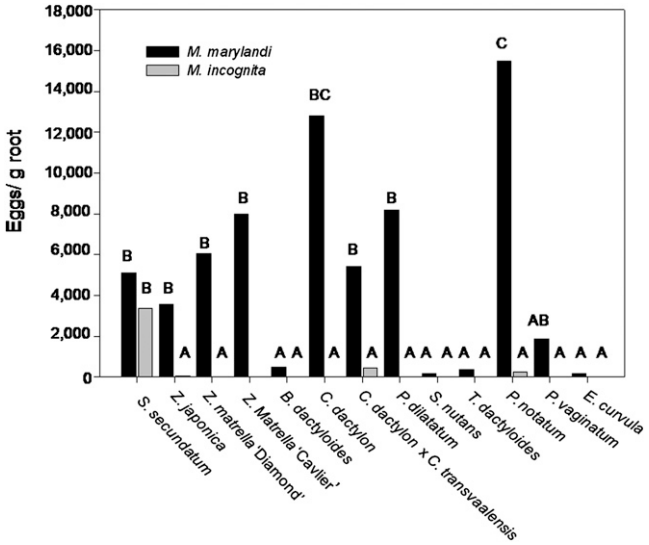

FIG. 1. Reproduction of *Meloidogyne marylandi* and *M. incognita* on several grass species. Bars with the same letter are not different at $P = 0.05$.

These data confirm and extend previous reports that *M. marylandi* reproduces well on numerous wild grasses, turfgrasses, and grain crops. Further, no dicot species tested supported detectible levels of reproduction. Most of the grasses tested were relatively poor hosts for the isolate of *M. incognita* from cotton used in this study, which suggests that *M. marylandi* is likely to be more common on grasses in Texas than *M. incognita*. The population of *M. marylandi* used in this study had a high level of reproduction on *S. secundatum* in this study whereas Oka et al. (2003) did not observe any reproduction by their isolate of *M. marylandi* on *S. secundatum*. Additionally the Texas isolate of *M. marylandi*

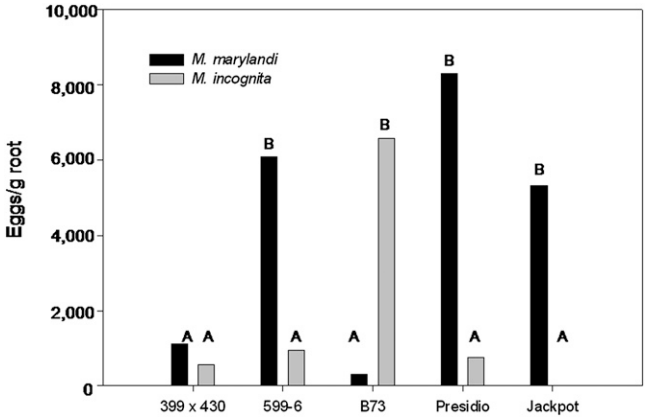

FIG. 2. Reproduction of *Meloidogyne marylandi* and *M. incognita* on *Sorghum bicolor* (399 x 430 and 599-6), *Zea mays* (B73), *Oryza sativa* (Presidio), and *Triticum aestivum* (Jackpot). Bars with the same letter are not different at $P = 0.05$.

had a low level of reproduction on the maize inbred line B73 whereas Oka et al. (2003) reported no reproduction of their isolate on maize. This observation is consistent with reports that maize genotypes vary greatly relative to their susceptibility to *M. incognita* (Windham and Williams, 1988) and may be expected to vary also in susceptibility to *M. marylandi*. Similarly, we observed that the sorghum accession SCO599-6 was a significantly better host for *M. marylandi* than was the hybrid ATx399 X RTx430. Collectively these observations indicated that variation in the susceptibility is to be expected within the gene pools of some host grasses and that a screening of the germplasm collection of several hosts will likely identify resistant genotypes.

Literature Cited

Araki, M. 1992. The first record of *Meloidogyne marylandi* Jepson and Golden, 1987 from *Zoysia* spp. in Japan. Japanese Journal of Nematology 22:49–52 (in Japanese).

Esbenshade, P. R., and Triantaphyllou, A. C. 1985. Use of enzyme phenotypes for identification of *Meloiodogyne* species. Journal of Nematology 17:6–20.

Hussey, R. S., and Barker, K. R. 1973. A comparison of methods of collecting inocula of *Meloidogyne* spp., including a new technique. Plant Disease Reporter 57:1025–1028.

Jepson, S. B., and Golden, A. M. 1987. *Meloidogyne marylandi* n. sp. (Nematoda: Meloidogynidae), a root-knot nematode parasitizing grasses. Pp. 263–265. *in* S. B. Jepson, ed. Identification of root-knot nematodes (*Meloidogyne* species). Wallingford, UK: CABI Publishing.

Kimmons, C. A., Gwinn, K. D., and Bernard, E. C. 1990. Nematode reproduction on endophyte-infected and endophyte-free tall fescue. Plant Disease 74:757–761.

Oka, Y., Karssen, G., and Mor (Mordechai), M. 2003. Identification, host range, and infection process of *Meloidogyne marylandi* from turf grass in Israel. Nematology 5:727–734.

Orr, C. C., and Golden, A. M. 1966. The pseudo-root-knot nematode of turf in Texas. Plant Disease Reporter 50:645.

Starr, J. L., Ong, K. L., Huddleston, M., and Handoo, Z. A. 2007. Control of *Meloidogyne marylandi* on bermudagrass. Nematropica 37:43–49.

Windham, G. L., and Williams, W. P. 1988. Resistance of maize inbreds to *Meloidogyne incognita* and *M. arenaria*. Plant Disease 72:67–69.