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Reproduction of *Meloidogyne arenaria, M. incognita,* and *M. javanica* on Sesame

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Abstract: Reproduction of *Meloidogyne arenaria* race 1, *M. incognita* races 1 and 3, and *M. javanica* on 10 cultivars of sesame (*Sesame indicum*) was examined in greenhouse tests. Sesame cultivars were also evaluated in a field infested with *M. arenaria*. Sesame was a poor host for *M. incognita* races 1 and 3 as no sesame genotype supported more than 70 eggs/g root. Reproduction of *M. arenaria* race 1 on sesame varied from 20 eggs/g roots for cultivar Sesaco 7CB to 1,570 eggs/g roots for Sesaco 110 in the greenhouse. Two cultivars that supported moderate levels of reproduction (128–160 eggs/g root) in greenhouse tests, however, supported only low final population densities (<40 eggs and second-stage juveniles [J2]/500 cm^3 soil) in field plots. In the same test, the peanut cultivar Florunner supported final population densities of 2,490 eggs and J2/500 cm^3 soil. Reproduction of *M. javanica* on sesame in the greenhouse varied from 580 to 8,230 eggs/g root. These data suggest that sesame may be an effective rotation crop for control of *M. arenaria* or *M. incognita* but not *M. javanica*.

Key words: crop rotation, *Meloidogyne arenaria, Meloidogyne incognita, Meloidogyne javanica,* root-knot nematode, *Sesame indicum.*

Root-knot nematodes are important and widespread pathogens of several crops, especially cotton (*Gossypium hirsutum*) and peanut (*Arachis hypogaea*), in the southern United States, including Texas. In 13 counties of the Southern High Plains of Texas, more than 50% of the cotton fields are infested with *Meloidogyne incognita* (8). The nematode is present at lower frequencies in other regions of the state (8). *Meloidogyne arenaria* race 1 is the predominant root-knot species attacking peanut in Texas, with up to 30% of the peanut fields in some counties infested (9). In addition to *M. arenaria,* a population of *M. javanica* parasitic on peanut was identified from one field in Frio County (Starr, *Unpubl.*).

Cotton or peanut cultivars with a high level of resistance to root-knot nematodes are not available, and these pathogens are usually managed by use of nematicides and(or) crop rotation. Sesame (*Sesame indicum*) is being considered by some cotton and peanut producers as a useful rotation crop because of its drought-tolerance and resistance to Phymatotrichum root-rot. Sesame production in Texas has increased from 60 ha in 1987 to 12,000 ha in 1993 (R. Langham, *pers. comm.*). There are few data, however, on the host status of sesame to different *Meloidogyne* species. Rodríguez-Kábana et al. (7) reported limited reproduction of *M. incognita* and *M. arenaria* on four sesame cultivars. The *M. arenaria* isolate used in those tests was obtained from peanut and was presumably a race 1 isolate. No race identification was given for the *M. incognita* isolate. The objective of this study, therefore, was to further evaluate the host status of additional sesame genotypes to isolates of known races of *M. arenaria, M. incognita,* and *M. javanica.*

Materials and Methods

The species identification of all root-knot isolates used in these tests was confirmed by esterase phenotype analysis (2) and the races were determined based on reproduction of each isolate on standard host differentials (3) (data not shown). *Meloidogyne arenaria* race 1 (no. 82-4) was obtained from peanut, *M. incognita* race 3 (no. 82-2) was isolated from cotton, *M. incognita* race 1 (no. 86-1) was obtained from J. N. Sasser and was originally isolated from tobacco (*Nicotiana tabacum* L.) in North Carolina, and *M. javanica* (no. 93-9) was isolated from potato in Texas and is

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parasitic on peanut. All nematode populations were maintained on *Lycopersicon esculentum* 'Rutgers' in greenhouse cultures. Inoculum of each root-knot species was prepared by the NaOCl method (4).

To determine the relative host status of sesame to the different species and races of *Meloidogyne,* seeds of 10 sesame cultivars (obtained from Sesaco Corp., San Antonio, TX) were planted separately into 20-cm-d pots filled with a coarse sand-peat potting mix (6:1, V/V). Emerging seedlings were thinned to one per pot after development of the first true leaf. There were a minimum of five pots for each sesame genotype for each nematode isolate. As positive controls, additional pots were planted to Rutgers tomato for *M. javanica,* peanut (*A. hypogaea* 'Florunner') for *M. arenaria* race 1, and cucumber (*Cucumis sativus* 'P-76') for *M. incognita* races 1 and 3. Each pot was infested with a suspension of 10,000 eggs of the designated nematode isolate, pipetted into three depressions in the soil around the base of the seedling 1 week after thinning. Plants were maintained in a greenhouse with an ambient temperature of 23–30 C.

Plants were harvested 8 weeks after soil infestation. Soil was washed from the roots with tap water and the roots were blotted dry and weighed. Roots were treated with 1.04% NaOCl to extract nematode eggs (4). Data on eggs per gram fresh root were subjected to analysis of variance with the general linear models procedure of SAS (SAS Institute, Cary, NC), with mean separation by least significant differences. Data from experiments with different nematode isolates were analyzed separately.

In an irrigated field test near Pleasanton, Texas, two sesame cultivars previously tested in the greenhouse (Sesaco 7CA and S-11) and eight additional cultivars (Sesaco S-15, 54A, 55A, 7AB, 7CB, LDA, 14A, and 14B) were planted in 2-row plots (91 cm between 6-m long rows) in a field infested with *M. arenaria* in randomized complete blocks with four replications. Sesame stands were thinned following emergence to 10 plants/m row. Florunner peanut was included as a positive control. Composite soil samples (10 2.5-cm-d cores/plot) were collected at planting, 8 weeks after planting, and at crop maturity. Second-stage juveniles (J2) in the soil and eggs associated with host root fragments were extracted from 500-cm^3 subsamples by elutriation (1,9) and centrifugation (5). Sesame grain yields were determined at physiological maturity from stalks cut from a 6-m length of row from each plot, sun dried, and threshed with a stationary combine.

Results and Discussion

All sesame genotypes were poor hosts for races 1 and 3 of *M. incognita,* as no nematode eggs were recovered from 95% of the inoculated plants (Table 1). The highest number of eggs recovered from any single plant was 250 eggs/g root from one 7CB plant inoculated with race 3; the mean for this sesame cultivar/root-knot isolate combination was 70 eggs/g root. Cucumber supported a mean of 1,920 and 2,180 eggs/g root when inoculated with *M. incognita* races 1 and 3, respectively. These data were similar to those of Rodríguez-Kábana et al. (7), who reported that sesame was a poor host for *M. incognita.*

The sesame cultivars supported limited reproduction of *M. arenaria* race 1 in the greenhouse test. The cultivars supported different levels of nematode reproduction with a range of 50 to 1,570 eggs/g root across all sesame genotypes ($P = 0.05$) (Table 1). All cultivars supported lower reproduction of *M. arenaria* than did peanut.

In the field test, no sesame genotype supported a midseason or at-harvest population density of *M. arenaria* of greater than 40 eggs and J2/500 cm^3 soil, whereas mean population densities on peanut were 2,490 eggs and J2/500 cm^3 soil at harvest. Population densities of *M. arenaria* at planting were ca. 10 J2/500 cm^3 soil across all plots. Thus, although limited reproduction of *M. arenaria* was observed in the

TABLE 1. Reproduction of *Meloidogyne arenaria* race 1, *M. incognita* races 1 and 3, and *M. javanica* on cultivars of sesame in greenhouse tests. Peanut, cucumber, and tomato, respectively, were used as positive controls in these tests.

Host	Eggs/g fresh root			
	M. incognita-R1[a]	*M. incognita*-R3[a]	*M. javanica*	*M. arenaria*
		Sesame		
634	0	0	8,230	50
7CA	0	0	7,560	128
112	10	0	7,040	770
7CB	0	70	6,740	20
110	0	0	5,900	1,570
71C	0	0	5,030	300
S-11	10	20	940	180
516	0	0	820	150
71A	0	0	780	210
BTET	0	0	580	130
LSD0.05	NS	NS	6,710	550
Peanut	—	—	—	5,500
Cucumber	1,920	2,810	—	—
Tomato	—	—	42,000	—

Values are means of five individual plants, each inoculated with 10,000 eggs of the indicated nematode species.
[a] R1 = race 1 and R3 = race 3.

greenhouse, sesame did not maintain the nematode population under field conditions. The variation in reproduction among sesame genotypes in the greenhouse suggests that some might support greater reproduction of *M. arenaria* in infested fields. Sesame yields did not differ among genotypes in this field test. The mean grain yield was 1,560 kg/ha, with a range of 1,350 to 1,810 kg/ha.

Tomato was a better host for *M. javanica* than any sesame cultivar, with a mean of 42,000 eggs/g root. Reproduction on sesame varied among cultivars with a mean across cultivars of 4,370 eggs/g root ($P = 0.05$) (Table 1).

Sesame appears to be a suitable rotation crop for management of populations of *M. arenaria* and *M. incognita* on peanut and cotton, respectively. Many sesame genotypes, however, would not be effective for rotation with peanut in fields infested with populations *M. javanica* parasitic on peanut. The variation observed among sesame genotypes suggests that some genotypes support sufficiently low nematode reproduction to be useful for rotation. Fortunately, most populations of *M. javanica* in the United States are not parasitic on peanut. In addition to the population from Frio County, Texas (Starr, unpubl.), there has been one other report in the United States (Georgia) of a population of *M. javanica* parasitic on peanut (6).

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