Differential Host Responses to *Meloidogyne* from Eastern Nigeria

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ABSTRACT

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Of 10 populations of three species of *Meloidogyne (M. arenaria, M. javanica,* and *M. incognita)* from eastern Nigeria, none was pathogenic to differential cultivars of cotton or peanut but all were pathogenic to differential cultivars of tomato and watermelon. Responses were variable on differential cultivars of pepper and tobacco. These results differed somewhat from those obtained in North Carolina: *M. incognita* attacked cotton and *M. arenaria* attacked peanut. Results with other differential hosts were similar but not identical to results from Nigeria.

The worldwide distribution of root-knot nematodes (*Meloidogyne* spp.) and their involvement with other pathogens make the nematodes prominent disease agents affecting the world's food supply (3,4). Root-knot nematodes cause immense crop losses in developing nations, where control of these pests is by use of certain cultural practices, crop rotation, and resistant cultivars (4).

This work relates to a goal of the International Meloidogyne Project: to advance knowledge about an important group of plant-parasitic nematodes. Root-knot nematode species and possible biotypes from eastern Nigeria were identified in this project.

MATERIALS AND METHODS

Ten populations of root-knot nematodes were collected from diverse hosts, types of agriculture, and habitats ranging from the coastal forests to the rain forests and the Guinea Savanna of Nigeria. These populations were maintained and propagated on tomato (*Lycopersicon esculentum* 'Bonny Best'). Galled tomato roots from each population were excised and washed in tap water to obtain eggs. Galled roots were placed in a jar containing 200 ml of 10% Clorox solution. The lid of the jar was closed tightly, the jar was shaken vigorously for 4 min, and the egg suspension was quickly passed through a 200-mesh sieve nested in a 500-mesh sieve (1). The 500-mesh sieve containing eggs was held under a slow stream of cold tap water to remove residual Clorox. The eggs were then rinsed into a 2-L flask. By repeating this procedure, eggs were concentrated in a flask, and the number of eggs was counted in 1 ml of the suspension.

Seedlings (7–10 cm tall) of tomato (*L. esculentum* 'Rutgers'), tobacco (*Nicotiana tabacum* 'NC95'), pepper (*Capsicum frutescens* 'California Wonder'), peanut (*Arachis hypogaea* 'Florrunner'), watermelon (*Citrullus vulgaris* 'Charleston Gray'), and cotton (*Gossypium hirsutum* 'Deltapine 16') were transplanted into steam-sterilized soil in 10-cm clay pots, with three replicates. Plants were inoculated at the time of transplanting with 10,000 eggs per pot by adding the inoculum in depressions made in the soil. Plants were grown at 24–30 C for 50 days after inoculation. Egg masses and galls were rated according to the following scale: 0 = 0, 1 = 1 or 2, 2 = 3–10, 3 = 11–30, 4 = 31–100, and 5 = more than 100 galls or egg masses per root system (1).

Between 15 and 30 egg masses from each of the 10 populations were placed in small vials containing 1% saline solution and mailed to the Centre of the International Meloidogyne Project, Raleigh, North Carolina. These were propagated on Rutgers tomato, and differential hosts were inoculated with nematode eggs as was done in Nigeria. Seeds used in Nigeria were supplied from the project center. Species were identified at both locations to assure the identity of the populations used in the experiments. Species identification of population 006 was not confirmed in Raleigh.

RESULTS AND DISCUSSION

Table 1 shows the identity of the *Meloidogyne* spp. and results of the differential host tests. Although other diagnostic features were present, lateral lines in the perineal patterns of females in population 006 were not as distinct as in other populations of *M. javanica.* This was probably a wild population or an intermediate type common in West Africa (2). Ratings in Raleigh and Nsukka differed in 10 instances in that a plant rated susceptible to a *Meloidogyne* sp. in Raleigh (> 2) appeared resistant (< 2) in Nsukka, and vice versa.

Populations 001 and 004 (*M. arenaria*) severely infected tobacco in Raleigh but failed to be infectious in Nsukka. Populations 002, 005, 006, and 010 of *M. javanica* consistently infected tobacco in Raleigh. *M. incognita* race 1 (008) did not infect tobacco in Raleigh but severely infected it in Nsukka. The results of the four populations of *M. incognita* race 1 (003, 007, 008, and 009) varied in response to differential hosts. By their

Table 1. Effects of populations of *Meloidogyne* spp. on differential hosts

Population	Species Habitat	Race	Host					
			Tobacco	Cotton	Pepper	Watermelon	Peanut	Tomato
001	*M. arenaria* Nsukka	2	5/0[a]	0/0	0/0	4/3	0/0	5/5
002	*M. javanica* Enugu	···	4/0	0/0	0/0	5/5	0/0	5/5
003	*M. incognita* Port Harcourt	1	0/0	0/0	5/0	5/5	0/0	5/5
004	*M. arenaria* Ebubu	···	5/0	0/0	1/5	4/3	0/0	5/5
005	*M. javanica* Ogoni	···	5/5	0/0	2/0	5/5	0/0	5/5
006	*M. javanica* Asa	···	5/5	0/0	0/0	5/5	0/0	5/5
007	*M. incognita* Umudike	1	0/0	0/0	4/0	5/5	0/0	5/5
008	*M. incognita* Calabar	1	0/5	0/0	5/5	5/5	0/0	5/5
009	*M. incognita* Okigwe	1	0/0	0/0	5/0	5/5	0/0	5/4
010	*M. javanica* Abakaliki	···	4/0	0/0	2/5	4/5	0/0	5/5

[a]Numbers represent results from: Raleigh, North Carolina/Nsukka, Nigeria. Each number is highest rating from three replicates, according to a scale of: 0 = 0, 1 = 1 or 2, 2 = 3–10, 3 = 11–30, 4 = 31–100, and 5 = more than 100 galls or egg masses per root system.

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infections on tobacco and pepper, populations 003, 007, and 009 seem to be more closely related to each other than to 008. None of the populations appeared to be mixed.

Tobacco and cotton have been used to determine races in *M. incognita*. When both plants are resistant to a population of *M. incognita*, the population is designated race 1; if tobacco is susceptible and cotton is resistant, the population is race 2 (J. N. Sasser, *unpublished data*). Thus, population 008, determined in Raleigh as *M. incognita* race 1, responded as *M. incognita* race 2 in Nsukka. The cause for this inconsistency is not understood, but geographic influences could be important because they can affect the genetic stability of nematodes or seeds and thus alter the usual responses. It is also possible that although nematode eggs in 1% saline reached North Carolina, other natural biologic control agents were not present. A benefit from this work is shown in the existence of pathogenic variations among species or in populations of the same species.

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