

**OTHER CONTRIBUTIONS - OTRAS COLABORACIONES
RESEARCH PAPERS - TRABAJOS DE INVESTIGACION**

NEMATODES ASSOCIATED WITH SORGHUM IN PUERTO RICO [NEMATODOS ASOCIADOS CON SORGO EN PUERTO RICO]. Domingo Bee-Rodríguez and Alejandro Ayala, Calle Ira. No. 2613, Santiago, Veraguas, Panamá, República de Panamá, and Nematologist, University of Puerto Rico, Mayagüez Campus, Agricultural Experiment Station, Mayagüez, Puerto Rico 00708.

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ABSTRACT

A field study of sorghum *Sorghum bicolor* (L.) Moench) was conducted at 2 agricultural substations (Fortuna and Lajas) and the experimental farms of the Mayagüez Institute of Tropical Agriculture at Mayagüez and Isabela in Puerto Rico. *Pratylenchus zae*, *Helicotylenchus* sp., *Tylenchorhynchus crassicaudatus*, *Aphelenchus* sp., *Aphelenchoides* sp., were the most commonly recovered phytoparasitic nematodes. All but *T. crassicaudatus* were present in the 4 localities. *Pratylenchus zae* was considered the most important parasite of sorghum under local conditions, based on its virulence and population density and distribution. Nematode population densities of *P. zae* were higher in neutral than in acid soils. Population densities were greater in localities with lower temperatures and lighter soils.

INTRODUCTION

Sorghum (*Sorghum bicolor* (L.) Moench) is a mayor crop in Africa, India, China, Manchuria, and the United States, and an important source of food in Asia, Iran, Turkistan, Pakistan, Korea, Japan, Australia, and Southern Europe. Its significance is increasing in Tropical America.

Cultivation of sorghum in Puerto Rico is limited to a few hundred acres for forage and experimental plots at some substations of the Agricultural Experiment Station of the Univeristy of Puerto Rico and Mayagüez Institute of Tropical Agriculture, where research is under way for development and improvements of varieties for parts of the United States and Latin America.

Little is known about phytoparasitic nematodes associated with sorghum roots. Endo (4) reported that *Pratylenchus zae* reproduces well in the roots of corn (*Zea mays* L.) and sorghum. Johnson and Burton (7) demonstrated that the granular nematicides aldicarb and phenamiphos (11.2 kgs ai/ha) increased growth and yields of millet and hybrids of Sudan grass infected with *Pratylenchus brachyurus* and *P. zae*.

The present study was undertaken to identify nematodes associated with sorghum roots under Puerto Rican conditions, and determine their population density and relative distribution. The information should help in the development of research projects geared at increasing the cultivation of this nutritive crop in the tropics, where large amounts of food are badly needed.

MATERIALS AND METHODS

Four locations in Puerto Rico where sorghum is cultivated for experimental purposes were selected for the study (substations of the Agricultural Experiment Station at Lajas, and Ponce (Fortuna) and experimental farms of the Mayagüez Institute of Tropical Agriculture at Isabela and Mayagüez). Fifteen soil samples were taken at each locality. Each sample consisted of 6 subsamples taken at random and at a depth of 15-20 cm. They were processed for nematodes using a combination of the sieving and screening methods as described by Christie and Perry (3).

The nematodes recovered were identified using a binocular stereoscopic microscope and their population densities calculated. Soil texture, pH, and air temperature were recorded from each locality. Soil texture was determined with a Bouyoucous hydrometer, and pH by means of a potentiometer.

RESULTS AND OBSERVATIONS

The seven nematodes most frequently encountered were *Pratylenchus zaei*, *Helicotylenchus* spp., *Aphelenchus* sp., *Aphelenchoides* sp., *Tylenchus* sp., and *Tylenchorhynchus crassicaudatus* (Table 1).

Six of these were present in all four localities. *T. crassicaudatus* was not found at Isabela. Soil at Isabela and Fortuna contained the highest population densities of phytoparasitic nematodes.

T. crassicaudatus, *P. zaei* and *Helicotylenchus* spp. were the most frequently occurring nematodes at Mayagüez, Lajas, Fortuna and Isabela, respectively (Table 2). *Rotylenchulus reniformis* appeared in a large number of samples taken at Lajas. *Pseudhalechus* sp. was recovered only at Lajas; whereas, *Psilenchus* sp. was isolated only from Mayagüez. *Hemicriconemoides cocophillus* and *Tylenchus* sp. were isolated from around roots of sorghum at Fortuna. *Dorylaimus*, *Neotylenchus*, *Trophurus*, *Meloidogyne* and *Nothotylenchus* were present only at Lajas. *Rotylenchulus reniformis* was present at Mayagüez and Lajas and *Longidorus* sp. at Lajas and Fortuna. There were more species recovered at Lajas than at any of the other localities. The highest population densities of phytoparasitic species occurred at Isabela and Fortuna. It was at these localities also that *P. zaei*, considered the most virulent, predominated.

Nematode population densities were similar in the acid soils of Isabela and the neutral soils of Fortuna (Table 2). *P. zaei* was more numerous at Fortuna (soil pH-7.3) than at Isabela (soil pH-4.4). The highest population levels were obtained at lower soil temperatures. Nematode densities were higher at Lajas, Isabela and Fortuna where sand and lime content were higher than at Mayagüez with a higher percentage of clay particles.

DISCUSSION AND CONCLUSIONS

In the study conducted in 2 Substations and the Mayagüez Institute of Tropical Agriculture, a large number of genera and species of phytoparasitic and suspected parasites were recovered from around roots of sorghum. The lesion nematode, *P. zaei* is probably the most important species associated with sorghum in the areas under study. Its populations were high and was present in most samples. A complete picture, however, was not obtained because root samples were not processed. The results are similar to those reported by Jenkins (6) for corn. *T. crassicaudatus* was present in 3 of the four localities. It has also been reported in related crops such as corn and grass (8)

Table 1. Occurrence and population densities of stylet bearing nematodes associated with sorghum (*Sorghum bicolor*) in 4 locations in Puerto Rico.

Nematode	Nematodes per/250 cm ³ Soil (% occurrence)			
	Mayagüez	Lajas	Fortuna	Isabela
<i>Pratylenchus zeae</i>	63 (9.8)	32 (3.3)	792 (53.4)	447 (28.4)
<i>Helicotylenchus</i> sp.	104 (16.1)	39 (4.1)	176 (11.8)	591 (37.6)
<i>Aphelenchus</i> sp.	63 (9.8)	80 (8.4)	248 (16.7)	368 (23.4)
<i>Aphelenchooides</i> sp.	80 (12.4)	8 (0.8)	32 (2.1)	32 (2.0)
<i>T. crassicaudatus</i>	32 (4.9)	464 (48.7)	56 (3.7)	0 (0.0)
<i>Tylenchus</i> sp.	279 (43.5)	56 (5.9)	48 (3.2)	48 (3.5)
<i>Pseudhalenchus</i> sp.	0 (0.0)	0 (0.0)	0 (0.0)	80 (5.1)
<i>Psilenchus</i> sp.	8 (1.2)	0 (0.0)	0 (0.0)	0 (0.0)
<i>R. reniformis</i>	15 (2.3)	176 (18.4)	0 (0.0)	0 (0.0)
<i>Hemicriconemoides cocophillus</i>	0 (0.0)	0 (0.0)	63 (4.3)	0 (0.0)
<i>Dorylaimus</i> sp.	0 (0.0)	15 (1.6)	0 (0.0)	0 (0.0)
<i>Neotylenchus</i> sp.	0 (0.0)	8 (0.8)	0 (0.0)	0 (0.0)
<i>Trophyrurus</i> sp.	0 (0.0)	8 (0.8)	0 (0.0)	0 (0.0)
<i>Longidorus</i> sp.	0 (0.0)	15 (1.6)	8 (0.5)	0 (0.0)
<i>M. incognita</i>	0 (0.0)	8 (0.8)	0 (0.0)	0 (0.0)
<i>Nothotylenchus</i> sp.	0 (0.0)	48 (5.0)	0 (0.0)	0 (0.0)
<i>Tetylenchus</i> sp.	0 (0.0)	0 (0.0)	63 (4.3)	0 (0.0)

Table 2. Stylet-bearing nematodes, pH, air temperature and soil texture associated with sorghum at four localities in Puerto Rico.

Locality	pH	Air temperature (° C)	(%)			Nematodes per 250 cm ³ soil
			Sand	Lime	Clay	
Mayagüez	5.85	28.5	17.00	18.00	65.00	644
Lajas	4.47	26.1	28.00	22.00	50.00	957
Fortuna	7.26	26.9	40.56	27.56	31.88	1486
Isabela	4.41	25.3	20.56	19.56	59.88	1566

and sugarcane (2). Some of the genera isolated are merely suspected parasites and their importance as plant pathogens have not been established. *Aphelenchus* and *Tylenchus* were frequently isolated from soil samples in most of the localities.

Although pH did not generally seem to influence populations of phytoparasitic nematodes, *P. zae* was more numerous in the neutral soils of Fortuna than in the acid soils (4.41) of Isabela. This may indicate that this nematode reproduces and survives better in soils with a pH of 4.4. The optimum pH for their reproduction was between 5.2 and 6.4

Temperature influences nematode survival and reproduction (10). In our studies the soil temperature data were not conclusive. Soil temperature was not recorded for a reasonable length of time. The average air temperature was slightly higher in the southern coast (Fortuna and Lajas) than the northern coast (Isabela).

Soil type has a direct effect on nematode survival, activity and motility; different nematode species differ in their preference for lighter or heavier soils. The influence of soil type on plant parasitic nematodes is a highly complex problem because physical and chemical factors vary so greatly between different localities (10). Ayala and Allen (1) reported that *Trichodorus allius* reproduced better in light soils, but Hollis and Fielding (5) found in Louisiana that distribution of *Trichodorus* was independent of soil type. The nematode genera *Meloidogyne*, *Belonolaimus* and *Dolichodorus* are more common in lighter soils; whereas, *Ditylenchus* prefers heavier soils.

RESUMEN

En un estudio de campo en dos Subestaciones Experimentales del Recinto Universitario de Mayagüez (Lajas y Fortuna) y las fincas experimentales del Instituto Mayagüezano de Agricultura Tropical, los nematodos más abundantes en la rizosfera del sorgo (*Sorghum bicolor* (L.) Moench) fueron: *Pratylenchus zae*, *Helicotylenchus* spp., *Aphelenchus* sp., *Aphelenchoides* sp., *Tylenchus* sp. y *Tylenchorhynchus crassicaudatus*. Con la excepción de este último, todos los géneros estaban presentes en las cuatro localidades. *Pratylenchus zae* es probablemente el nematodo de mayor importancia en este cultivo por su capacidad parasítica y su abundancia y distribución en la mayoría de los campos. El pH del suelo no parece afectar las poblaciones totales de nematodos, pero *P. zae* era más numeroso en suelos con pH 7.26, mientras los niveles poblacionales eran más bajos en pH de 4.41. La temperatura del ambiente y el tipo de suelo aparentan afectar las poblaciones; éstas eran más altas en suelos de textura ligera y a temperaturas más bajas.

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COMPARISON OF VARIOUS TREATMENTS FOR THE CONTROL OF *PRATYLENCHUS COFFEAEE* IN YAM [COMPARACION DE VARIOS TRATAMIENTOS PARA CONTROL DE *PRATYLENCHUS COFFEAEE* EN TUBERCULOS DE ÑAME]. Phyllis L. Coates-Beckford, Plant Protection Division, Ministry of Agriculture, Hope Gardens, Kingston 6, Jamaica., and C.W.D. Brathwaite, Department of Biological Sciences, University of the West Indies, Trinidad.

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ABSTRACT

Negro yam (*Dioscorea rotundata*) tubers were dipped for 30 min. in hot water (51C) and then in solutions of the nematicides oxamyl, phenamiphos, and diazinon or in solutions of the nematicides only. Tubers, treated with hot water and nematicides developed soft and wet roots whether planted or kept in storage. Root production was good in treatments with hot water, oxamyl alone, phenamiphos alone and the control. Populations of *Pratylenchus coffeae* were significantly reduced by the hot water dip, but this treatment had adverse physiological effects on distal portions of tubers. Treatment with oxamyl at 1200 or 2400 ppm was the most effective since nematode populations were significantly lowered and plant growth was unaffected; phenamiphos and diazinon were ineffective treatments.

INTRODUCTION

In Jamaica, yam (*Dioscorea spp.*) tubers are affected by a condition known locally as "burn" and universally as "dry rot". Disease symptoms readily observable in mature tubers are cracking of the skin and dark necrotic lesions which are corky in texture due to disintegration of the cortex. Tubers stored at ambient temperatures to be used either as food or planting material may show severe disease symptoms a few weeks after being harvested.