Intsormil

TRIP REPORT

BY

JORGE A. CUAREZMA
MISSISSIPPI STATE UNIVERSITY

CIAT-CALI, COLOMBIA

MAY 17 - AUGUST 6, 1983

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Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln

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Traveler: Jorge A. Cuarezma, Department of Plant Pathology and Weed Science, Mississippi State University

Purpose: To study nematode-fungal interactions in relation to sorghum root decline. This training provided on-site experience with sorghum culture in a tropical environment. The tenure at CIAT was necessary to fulfill a portion of requirements of a cooperative agreement between CIAT and INTSORMIL (A.I.D. Contract). Research performed with a portion of the requirements for completion of the Ph.D. degree in Plant Pathology.

Places Visited:

Colombia: Cali
CIAT
Palmira
Santander de Quilichao
La Pradera
Buga
Tuluá
La Unión
Silvia
Popayán
Bogotá

Persons Contacted:

Dr. Lynn M. Gourley, INTSORMIL, CIAT
Dr. John L. Nickel, Director General, CIAT
Mr. Ricardo Castañeda, Administrative Assistant, Government Relations, Bogotá
Dr. Douglas R. Laing, Director Crop Research, CIAT
Dr. Aart van Schoonhoven, Entomologist Coordinator Bean Program, CIAT
Dr. Marcial Pastor-Corrales, Bean Pathologist, CIAT
Dr. Francisco J. Morales, Bean Virologist, CIAT
Dr. Shree P. Singh, Plant Breeder, Bean Program, CIAT
Dr. J. Carlos Lozano, Pathologist, Cassava Program, CIAT
Dr. Sang-Won Ahn, Rice Plant Pathologist, CIAT
Dr. Jairo Castaño, Rice Plant Pathologist, CIAT
Dr. John E. Ferguson, Agronomist Seed Production, Tropical Pastures Program, CIAT
Dr. Mario Calderón, Entomologist, Tropical Pastures Program, CIAT
Dr. Jillian M. Lenné, Pasture Plant Pathologist, Tropical Pastures Program, CIAT
Dr. Fritz Kramer, Communication Scientist, International Cooperation, CIAT
Dr. Fernando Fernández, Coordinator Scientific Training, CIAT
Dr. Vartan Guiragossian, ICRISAT, CIMMYT

Dr. Lois A. Gram, The World Bank, Washington
Mr. Carlos A. Suárez, Orientation, CIAT
Mr. Alfredo Caldas, Admissions Administrator, CIAT
Mr. Johnson E. Douglas, Head, Seed Unit, CIAT
Mrs. Francia V. de Agudelo, Plant Pathologist, ICA-PALMIRA

Major Accomplishments:

1. The tenure at CIAT was necessary to fulfill the requirements of a cooperative agreement between CIAT and INTSORMIL (A.I.D. contract). Research performed was a portion of the quirements for completion of the Ph.D. degree in Plant thology.

2. In this work, an attempt was made to study the relationship between nematodes and soil-borne pathogens in grain sorghum in soils low or high in aluminium concentration.

3. To study the chronological order of occurrence and frequency of soil fungi and nematodes in relation to grain sorghum produced in the soils described above.

4. To study the taxonomy and frequency of occurrence of nematodes and their correlation with physical and chemical properties of soils throughout the Cauca Valley.

5. To provide a basic appreciation to workers in different agricultural programs of the impact of plant parasitic nematodes on crop production.

Observations:

The research performed at Santander de Quilichao and throughout the Cauca Valley was possible through the assistance of Drs. Lynn M. Gourley, Agronomist, Marcial Pastor-Corrales, Bean Plant Pathologist, Sang-Won Ahn and Jairo Castaño, Rice Plant Pathologists and their respective lab personnel at CIAT. Field and lab work were accomplished with the collaboration of Mrs. Francia V. de Agudelo, Plant Pathologist at Instituto Colombiano Agropecuario (ICA-PALMIRA) and Mrs. Manuel Coronado and Alvaro Játiva technicians at CIAT.

Santander de Quilichao Research Station:

Field studies were performed to determine fungi and nematodes associated with sorghum roots and stalks. Sampling was accomplished at 30, 60, and 90 days post-planting in plots with different Al concentration (1.3 and 3.1 milliequivalent/100 g soil). Root and soil samples from three hybrids (DeKalb 54, DeKalb 59, and DeKalb 42y) were taken at random from experimental units in a complete block design, replicated three times.

Analysis of the data showed a number of fungi associated with sorghum roots and stalks. Of the fungi isolated, Curvularia lunata

var. aeria, Phoma spp., and Fusarium moniliforme were isolated with the greatest frequency. C. Tunata var. aeria showed on average occurrence of 39% in roots with brick red to black lesions (symptomatic). Phoma spp. occurred in 18% and F. moniliforme in 16% frequencies in the low Al concentration plot. These same three fungi were recorded from samples in the high Al concentration with an average occurrence of 37, 28, and 14%, respectively (Table 1).

Nematode analysis of soil and root samples was conducted in conjunction with fungal analyses. Criconomella xenoplax and Helicotylenchus dihystera were found in soil samples (50 and 133 nematodes/250 cc of soil) taken from these plots.

Nematological Study Cauca Valley:

As part of a nematode study throughout the Cauca Valley, 74 fields comprising 1,346 ha were assayed for nematodes. Large fields were divided into 8-10 ha sections for sampling. Each subsample consisted of approximately 200-300 cc of soil from the rhizosphere of an individual plant. Four subsamples taken at random were combined to form one sample. Eighteen nematode genera were identified. Pratylenchus zeae and Helicotylenchus dihystera were found with greatest frequency and in highest numbers (Table 2).

Other Studies:

Colombia is a country with great agricultural potential. The agriculture is greatly diversified and a number of plant diseases were observed associated with losses of crop yields. One group of organisms implicated were nematodes. While visiting sorghum farms, owners were asked to check their crops for phytosanitary problems including insects, fungi, viruses, and nematodes. Leaves, stems, seeds, soil, and root samples were collected from a diversity of crops, such as, rice, tomatoes, onion, mango, grapes, passion fruits, coconut, citrus, cotton, platain, etc. These samples were carefully analyzed and pest management advice given when necessary. Also, personnel at ICA were consulted concerning various problems in order that extension information might be provided to the farmers through established programs. Certain programs at CIAT requested assistance in identifying the impact of nematodes on individual crops. A preliminary study was performed with rice from Carimagua at the request of personnel in charge of the CIAT Rice Program. Additionally, laboratory and support personnel were provided instruction in nematode extraction methods, taxonomy, and morphology. All lectures and demonstrations were directed toward increasing personnel awareness of the impact of nematodes on crop production.

Observations:

Sorghum production has increased in Colombia during the past years. Total area planted to sorghum in the Cauca Valley has been estimated at 19,000 ha which is approximately 17% of the total area planted to sorghum in Colombia.

The most important use for grain sorghum in the area is for animal production. Because of high production costs associated with other crops and the demonstrated resistance of sorghum to drought, it has become one of the most important crops in the Cauca Valley. However, pathological problems are a primary concern. Among the areas visited, charcoal rot was one of the most predominant diseases. Producers would like to increase sorghum production further but realize the limitations presented on soils of high Al saturation. More research is needed in the area of Al tolerance especially on the Llanos type soils. Since I was conversant in the native language and had many opportunities to visit with producers, it became obvious that technical information on sorghum production is a primary need. Although extension information is not included in the INTSORMIL mission, it might be appropriate to organize a workshop for agronomists throughout CIAT and ICA.

I believe INTSORMIL has a great future in Colombia. Many people will benefit from this program. The opportunity that I had to perform a portion of my research in Colombia was an invaluable experience. A scientific manuscript of the results has been prepared.

Table 1. Percentage of occurrence of fungi in soils of different Aluminium concentration at Santander de Quilichao, Colombia. 1983.

	Low Aluminium[a]				High Aluminium			
	Root[b]		Crown		Root		Crown	
Pathogens	S[c]	A	S	A	S	A	S	A
Curvularia lunata var. *aeria*	38.7	8.2	40.4	21.6	37.3	3.1	40.1	14.9
Phoma macrostoma	17.5	15.3	22.8	21.6	27.5	24.5	22.1	52.2
Fusarium moniliforme	15.7	4.4	21.1	11.8	14.1	2.0	26.0	1.5
Trichoderma viridae	9.1	44.3	8.8	27.5	8.9	46.9	5.2	10.5
Fusarium spp.	9.0	12.0	3.5	5.9	8.0	15.3	3.9	10.5
Penicillium spp.	3.9	10.4	1.8	5.9	0.5	3.1	1.3	4.5
Nigrospora sphaerica	2.0	-	-	-	1.2	-	-	-
F. lateritium	1.2	-	1.8	2.0	0.4	1.0	1.3	4.5
Absidia sp.	1.1	3.3	-	3.9	0.4	1.0	-	-
Aspergillus niger	0.8	1.1	-	-	0.3	-	-	-
F. roseum	0.6	0.6	-	-	1.0	2.0	-	1.5
Helminthosporium sativum	0.4	-	-	-	-	-	-	-
F. acuminatum	0.2	0.6	-	-	-	-	-	-
Papularia sp.	-	-	-	-	0.3	-	-	-
Chaetomium sp.	-	-	-	-	0.1	-	-	-

[a] 1.3 and 3.1 milliequivalent/100 gr Soil

[b] Including oate and hybrids

[c] Symptomatic: lesions on root
Asymptomatic: no lesions

Table 2. Plant-parasitic nematodes recovered from grain sorghum fields in Cauca Valley, Colombia.

Nematode	Absolute Frequency (%)	Absolute Density[a]	Relative Density(%)[b]
	Soil	Soil	Soil
Pratylenchus zeae	100.0	459.8[c]	63.7
Helicotylenchus dihystera	66.2	144.2	20.0
Tylenchorhynchus martini	37.8	92.1	12.8
Heterodera spp.	8.1	13.0	1.8
Rotylenchulus parvus	8.1	6.0	1.0
Rotylenchulus reniformis	4.1	3.4	1.0
Criconemella sp.	6.8	2.3	0.2
Peltamigratus sp.	1.4	1.0	0.1

[a] Average number of each nematode found in all samples

[b] Absolute density ÷ average density of all plant parasitic nematodes

[c] No. of nematodes per 250 cc of soil

Note: Tylenchoid, Dorylaimoid, and Aphelenchoid types are not listed.