

PLANT-PARASITIC NEMATODES ASSOCIATED WITH ANTHURIUMS AND OTHER TROPICAL ORNAMENTALS

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ABSTRACT

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Following the detection of *Radopholus similis* in anthuriums (*Anthurium andraeanum*) from a shade-house in Gran Couva, a survey was conducted of all shade-houses to determine the presence of *R. similis* and other plant-parasitic nematodes in varieties of anthuriums grown in Trinidad. *R. similis* was found in 16 of 21 varieties sampled. *Paratylenchus minutus*, *Pratylenchus coffeae*, *Meloidogyne incognita* and *Helicotylenchus dihystera* also were detected. Anthuriums infected by *R. similis* showed symptoms of root-rot, stunting and chlorosis. Ginger lilies (*Alpinia* sp.) and other ornamental crops were found to be hosts of one or more species of nematodes which included *M. incognita*, *Tylenchorhynchus annulatus* and *Xiphinema* spp. Management of problems caused by plant-parasitic nematodes includes the adoption of plant quarantine measures, phytosanitation and the application of nematicides.

Key words: anthuriums, ginger lilies, heliconias, *Radopholus similis*, *Xiphinema* spp., management.

RESUMEN

Bala, G. y F. Hosein. 1996. Nematodos fitoparasitos asociados a anturios y otras hornamentales tropicales. *Nematrópica* 26:9-14.

Despues de haberse detectado a *Radopholus similis* en plantas de Anturio (*Anthurium andraeanum*) bajo sombra en viveros de Gran Couva se decidió efectuar una prospección nematologica en las instalaciones del lugar bajo sombra para determinar el grado de presencia de *R. similis* y otros nematodos fitoparásitos en anturios de Trinidad. *R. similis* se encontró en 16 de las 21 variedades muestreadas. *Paratylenchus minutus*, *Pratylenchus coffeae*, *Meloidogyne incognita* y *Helicotylenchus dihystera* tambien fueron encontrados. Las plantas de anturio infectadas con *R. similis* mostraron síntomas de pudrición radical, achaparramiento y clorosis. Otras hornamentales del genero *Alpinia* como los lirios de gengibre, tambien se determinaron hospedantes de una a mas especies de fitonematodos como *M. incognita*, *Tylenchorhynchus annulatus* y *Xiphinema* spp. Las tácticas de manejo de problemas de nematodos en hornamentales incluye la adopción de medidas cuarentenarias, fitosanitarias y de combate químico. *Palabras clave:* anturios, lirios de gengibre, heliconias, manejo, *Radopholus similis*, *Xiphinema* spp.

INTRODUCTION

Traditionally, ornamental crop production in Trinidad and Tobago has been pursued by hobbyists and small-scale commercial growers who cater to local demand. Recently however, there has been increased interest in production of anthuriums (*Anthurium andraeanum* Linden

ex Andre), orchids (mainly *Dendrobium* spp.), ginger lilies (*Alpinia* sp.) and heliconias (*Heliconia* spp.) for export to North American and European markets. Between 1985 and 1991, approval was granted to import 0.5 million anthuriums, 1.4 million orchids, 0.03 million ginger lilies, 0.3 million heliconias and 3.4 million other ornamentals chiefly from Thailand,

Netherlands and North America (Anon, 1985-1991).

Several major disease problems occur on local ornamental crops. Anthuriums are affected by bacterial blight *Xanthomonas campestris* pv. *diffenbachiae* (McCulloch & Pirone) Dye, *Pseudomonas* blight (*Pseudomonas* sp.), and bacterial wilt (*Pseudomonas solanacearum* Smith) (Bala, 1984; Dilbar, 1991). The burrowing nematode, *Radopholus similis* (Cobb) Thorne, induces the condition known as anthurium decline. This disease is important also in Hawaii and Jamaica (Arnold *et al.*, 1988; Aragaki *et al.*, 1984; Hutton *et al.*, 1980). Heliconias are affected by bacterial wilt disease (*P. solanacearum*) and ginger lilies are affected by the root-knot nematode, *Meloidogyne incognita* (Kofoid and White) Chitwood (diagnostic records, Plant Pathology Department, Central Experiment Station, Centeno).

Generally, anthuriums are cultivated in troughs located at ground level. A plastic sheet is placed at the bottom of the trough which is then filled with threshed coconut husk. Plants are grown essentially for export of blossoms to North American and European markets. In 1988, diagnosticians in the Plant Pathology Department, Central Experiment Station, Centeno, detected *R. similis* in anthuriums growing in a shadehouse in Gran Couva. Plants displayed stunting, chlorosis and general decline. This discovery resulted in a survey of all anthurium shade-houses and closer scrutiny of imported germplasm. The principal aim of the survey was to determine the status of *R. similis* in shadehouses because this nematode was considered to be of economic and quarantine importance.

MATERIALS AND METHODS

During 1988-1991, a total of 21 anthurium varieties from 14 shade-houses located mainly in the western part of Trin-

idad were sampled for the presence of plant-parasitic nematodes (Fig. 1). A composite sample of approximately 200 g roots were taken from plants of each variety. These plants, grown in troughs of threshed coconut husks, were randomly selected for sampling. At least 5 plants from each of 5 troughs per shadehouse were sampled. Roots were washed, cut into 2-cm-long pieces and a 10 g representative sample was blended in a Waring blender for 10-20 sec. The blended material was poured onto a double layer of facial tissue resting on modified Baermann funnels and left for 24 hrs. (Taylor, 1971). Thereafter, nematodes were identified and counted. Generally, nematode identification was confirmed or conducted by the International Institute of Parasitology, United Kingdom.

The Department of Plant Pathology diagnostic records for the period 1983-1991 also were examined to determine which plant parasitic nematode species are associated with ornamental plants on the island. For the diagnostic samples, nematodes from roots were extracted by the procedure outlined above, whereas nematodes from soil were extracted by Cobb's gravity and sieving technique and the use of modified Baermann funnels (Taylor, 1971).

RESULTS AND DISCUSSION

Eighteen plant-parasitic nematodes were found associated with various ornamental crops grown in Trinidad and Tobago (Table 1). *Radopholus similis* and *P. minutus* (Linford) Oliviera and Ishii were found to be associated primarily with anthuriums, whereas most of the other plant-parasitic nematodes were associated with a wider host-range.

Of the 21 cultivars of anthuriums sampled, 5 did not have detectable levels of plant-parasitic nematodes. Anneke, Fla-

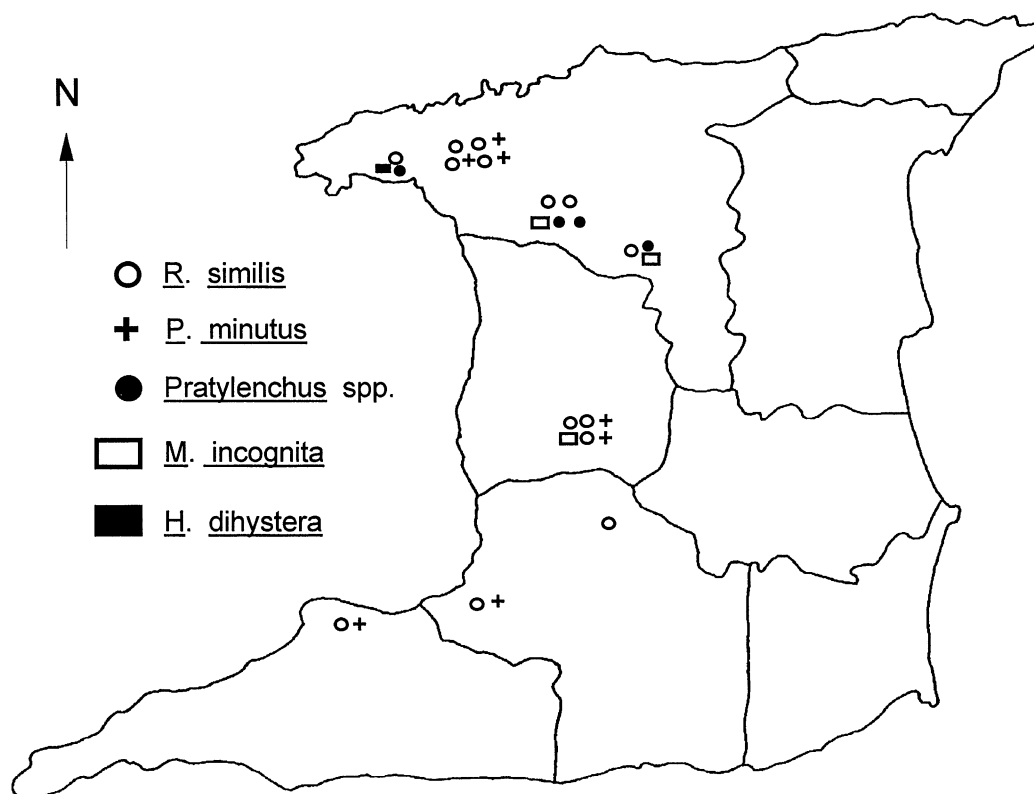


Fig. 1. Distribution of plant parasitic nematodes associated with anthuriums in Trinidad.

red, Hawaiian red, local hybrids, Tropical, and Uranus harboured greater than 1 000 *R. similis* per 10 g root. Bettine and Cuba supported populations of *R. similis* in excess of 500 nematodes/10 g root. Nematode infestation at these densities were associated with symptoms of root and stem rot, stunting of plants and chlorosis. Root-rot was sometimes associated with the presence of *Fusarium* spp. and *Rhizoctonia solani* (Kuehn).

R. similis, with a frequency (percent shadehouses detected) of 69%, was the most important nematode found in anthuriums in Trinidad (Fig.1). *Paratylenchus minutus*, with a frequency of 11.8%, was associated with *R. similis* in the varieties Fla-red, Claudia, Cuba, Anneke and Lunette. *Pratylenchus* spp. and *M. incognita*

occurred in situations where the roots were in contact with soil.

In Las Lomas, *M. incognita* was found at relatively high population densities in ginger lilies (2140 nematodes/10 g roots). Other plant-parasitic nematodes such as *Helicotylenchus* spp., *Rotylenchulus reniformis* Linford and Oliveira and *Peltamigratus* sp. along with *M. incognita*, were associated with root-rot, stunting and chlorosis of plants.

Generally, low population densities of nematodes were associated with heliconias, although *M. incognita* was found in one instance to cause severe root galling in the cultivar St. Vincent red. In 2 heliconia cultivars, Tropical Night's Pink and *H. caribea* Lam, relatively high populations of *Tylenchorhynchus annulatus* (Cassidy)

Table 1. Plant-parasitic nematodes associated with anthuriums and other tropical crops grown in Trinidad and Tobago.

Nematode	Crop	Frequency ^z
<i>Criconemella onoensis</i> (Luc, 1959) Luc and Raski, 1981	ginger lily (<i>Alpinia</i> sp.)	14.3
	bermudagrass (<i>Cynodon dactylon</i>)	b
	hibiscus (<i>Hibiscus rosa-sinensis</i>)	b
<i>Gracilacus</i> sp.	gerbera (<i>Gerbera</i> sp.)	b
<i>Helicotylenchus dihystra</i> (Cobb, 1893) Sher, 1961	anthuriums (<i>Anthurium andraeanum</i> Lind)	1.5
	heliconia	30.0
	ginger lily	28.6
	savannah grass (<i>Axonopus compressus</i>)	b
<i>H. pseudorobustus</i> (Steiner, 1914) Golden, 1956	ginger lily	28.6
	heliconia	b
	bermudagrass	b
<i>Helicotylenchus</i> sp.	ginger lily	42.9
	heliconia	30.0
	bermudagrass	b
	thuja (<i>Thuja</i> sp.)	b
<i>Hoplolaimus</i> sp.	ginger lily	b
<i>Meloidogyne incognita</i> (Kofoid and White, 1919) Chitwood, 1949	anthuriums	5.9
	ginger lily	85.7
	heliconia	50.0
	aloe (<i>Aloe vera</i>)	b
	gerbera	b
	hibiscus	b
<i>Paratylenchus minutus</i> Linford, Oliviera, and Ishii, 1949	anthuriums	11.8
	aloe	b
<i>Peltamigratus luci</i> (Sher, 1964)	ginger lily	28.6
<i>Pratylenchus coffeae</i> (Zimmerman, 1898) Filipjev and Shuurman Steckhoven, 1941	anthuriums	11.8
	ginger lily	b
<i>Pratylenchus zaeae</i> (Graham, 1951) <i>Pratylenchus</i> sp.	anthuriums	5.9
	ginger lily	14.3
	heliconia	20.0
	bermudagrass	b
	cypress (<i>Cupressus</i> sp.)	b

^z% occurrence in farms sampled (b = only one or two occurrences in one or two farms sampled).

Table 1. (Continued) Plant-parasitic nematodes associated with anthuriums and other tropical crops grown in Trinidad and Tobago.

Nematode	Crop	Frequency ^z
<i>Radopholus similis</i> (Cobb, 1893) Thorne, 1949	anthuriums	69.0
<i>Rotylenchulus reniformis</i> Linford and Oliviera, 1940	ginger lily	42.9
	heliconia	20.0
	aloe	b
	gerbera	b
	hibiscus	b
<i>Tylenchorhynchus annulatus</i> (Cassidy, 1930) Golden, 1970	ginger lily	14.3
	heliconia	40.0
<i>Xiphinema vulgare</i> (Tarjan, 1964)	aloe	b
<i>Xiphinema</i> spp.	heliconia	b
	cypress	b
	gerbera	b
	hibiscus	b
	bermudagrass	b
	thuja	b

^z% occurrence in farms sampled (b = only one or two occurrences in one or two farms sampled).

Golden (440 and 560/100 cm³ soil, respectively) were obtained. In *H. caribea*, these nematodes were associated with roots of plants that were affected by bacterial wilt.

Xiphinema spp. were associated with several ornamental crops, and at a population of 320 nematodes/100 cm³ soil, were suspected of causing stunting and chlorosis of potted gerberas (*Gerbera* sp.) grown at the La Reunion Propagation Station. This nematode also was found at densities of 587 nematodes/100 cm³ soil taken from the rhizosphere of debilitated aloe (*Aloe vera* L.) grown in Tobago.

These data collected indicate that plant-parasitic nematodes are important in ornamental crop production in Trinidad. The results indicate that *R. similis* is widespread in anthurium production, occurring at relatively high population densities on a large number of cultivars grown. A three-

pronged approach to manage *R. similis* in anthuriums has been adopted: revision of plant quarantine regulations for germplasm importation, field phytosanitation, and the application of appropriate nematocides.

Revision of the plant quarantine regulations for the importation of germplasm became imperative in 1989, when *R. similis* was detected in 3 consignments of planting material from The Netherlands which included one or more of the varieties Nicole, Fla-King and Bettine. In the same year, *P. minutus* was detected in a consignment of Lunette from The Netherlands. The quarantine guidelines permitted only the importation of tissue culture flask material, but upon the adoption of quarantine measures by the exporting country, ex-tissue-cultured germplasm of 15-18 cm in size was permitted for importation. Sub-

sequent to this revision, very few detections of plant-parasitic nematodes have been made in consignments of imported *A. andraeanum*.

Rigid measures for control and eradication of the burrowing nematode in anthuriums were recommended to mitigate production problems in shade-houses. Measures included destruction of severely infected plants, phytosanitation and treatment of plant and growing media with appropriate chemicals. Satisfactory results for the management of nematodes have been obtained by growers using oxamyl, aldicarb and fenamiphos (survey information, Plant Pathology Section, C.E.S. Centeno).

The severity of galling of roots induced by *M. incognita* in ginger lilies indicates that this nematode may be contributing to the observed decline in growth and production. Generally, growers are advised to apply nematicides such as oxamyl, isazofos, or propox. The presence of relatively high populations of stunt nematodes, *T. annulatus*, in the heliconia cultivars, Caribea and Tropical Night's Pink, should be further investigated concerning a possible interaction with bacterial wilt disease. Although *Xiphinema* spp. have been reported in soil taken from the rhizosphere of crop hosts in Trinidad (Bala, 1984), there is need to investigate their role in crop production due to the population densities detected.

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