Nematode Pests and Associates of Five Species of Chamaedorea

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A number of *Chamaedorea* species are grown commercially in Florida nurseries for both local and out-of-state markets. Many regulatory examinations have been made of the palms for nematodes by Division of Plant Industry nematologists in addition to a number of examinations of palms with severe growth problems.

A single female burrowing nematode (*Radopholus similis*) was found in August, 1955 on *Chamaedorea elegans* Mart. (*Neanthe bella* Cook), at Homestead Florida. Since that time 76 nematode examinations have been made of five species of *Chamaedorea*, results of which are summarized in Table 1.

Table 1 lists 13 genera and five species of plant-parasitic nematodes not previously reported as associates of *Chamaedorea*. Burrowing (Fig. 1-A), root-knot (Fig. 1-B), stubby-root and spiral nematodes were most commonly found associated with the palms. *Meloidogyne incognita* has been reported on *C. elegans* in Canada (2). Burrowing and lesion nematodes were reported on the same species in Florida in 1960 (5). Van Weerdt et al (4) cited two cases where several thousand of these palms grown under shade were heavily infested with burrowing nematode. Infected palms were stunted, spindly and had yellowed fronds (Fig. 2). Roots were sparse with extensive lesions (Fig. 3). Root symptoms observed on *C. elegans* infected by burrowing nematode in subsequent problem cases included disintegration, rot, and growth retardation. Stem symptoms included red, brown or black lesions on or in the basal stem. In some plants lesions extended into the stem ¼ to ½ inch above the soil line. Frond symptoms included wilt, burn, browning, and yellowing. In one palm observed, fronds developed from pale green to yellow to ash grey. Similar injury occurred in *C. elegans* infected with large numbers of lesion nematodes (Fig. 1-C). Two instances were noted where severe injury resulted in the presence of four genera of plant-parasitic nematodes. In one, spiral, lesion, root-knot, and burrowing nematodes were associated with severely yellowed plants that failed to grow satisfactorily. In the other, spiral, root-knot, stunt and burrowing nematodes were associated with large plantings of dead and dying palms. Although root-knot nematodes were detected four times, root-knot galls caused by *Meloidogyne incognita acrita* were noted only once.

The role of plant disease organisms in nematode-infested plants is almost always a consideration when severe injury is encountered. Fourteen cases were recorded where both nematode and plant disease analyses were made. In seven cases, burrowing nematodes were found associated with damage to palms in the absence of detected fungi or bacteria. In three cases *Fusarium* sp. was associated with burrowing nematode. By contrast, lesion and root-knot nematodes were found associated with *Fusarium* sp. in each case where dual analyses were made.

Palms infected with burrowing nematode present two economic ramifications. Primarily, burrowing nematode is a severe pest of the palms and is capable of preventing commercial pro-

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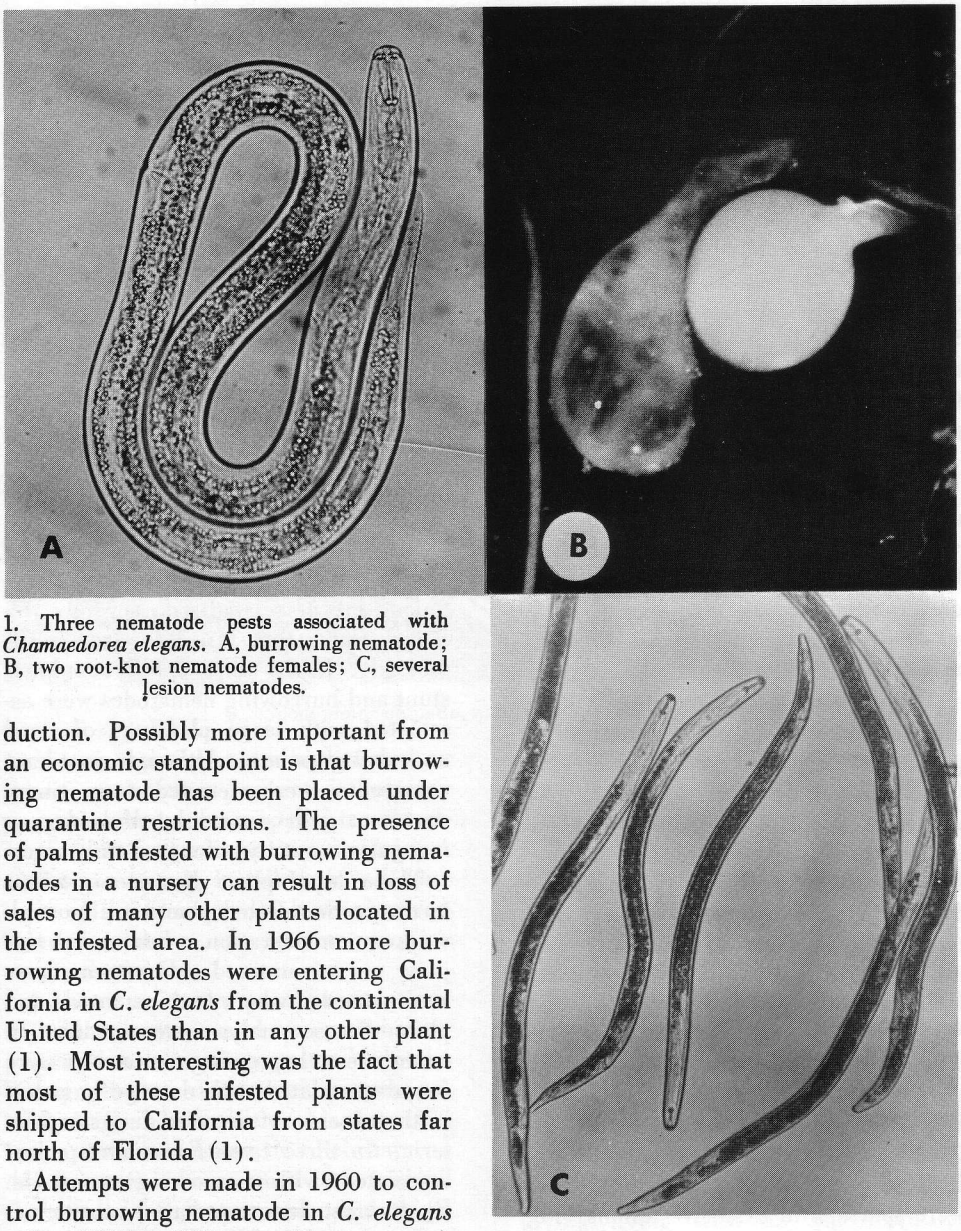

1. Three nematode pests associated with *Chamaedorea elegans*. A, burrowing nematode; B, two root-knot nematode females; C, several lesion nematodes.

duction. Possibly more important from an economic standpoint is that burrowing nematode has been placed under quarantine restrictions. The presence of palms infested with burrowing nematodes in a nursery can result in loss of sales of many other plants located in the infested area. In 1966 more burrowing nematodes were entering California in *C. elegans* from the continental United States than in any other plant (1). Most interesting was the fact that most of these infested plants were shipped to California from states far north of Florida (1).

Attempts were made in 1960 to control burrowing nematode in *C. elegans* using DBCP (Dibromochloropropane) at a rate of 4 gallons of the active ingredient per acre (5). A severe stunting of the treated palms resulted from the treatment.

In January 1965, Miller and Perry (3) eliminated burrowing nematodes from *C. elegans* by dipping bare-rooted palms for 30 minutes in a 600-800 ppm water solution of either Zinophos or Dasanit (Bayer 25141). (In one test, lesion and root-knot nematodes survived the treatment in the bulbous crown of the palm, indicating failure of the nematicides to penetrate the enlarged stem

2. *Chamaedorea elegans* seedlings. Left, stunted unthrifty plants grown in soil infested with burrowing nematode; right, a healthy young plant.

bases.) Mass-dip treatments using Zinophos or Dasanit can be made using plastic-lined soil trenches or plastic-lined cattle-watering tanks (Tanks used for such a purpose should not be used to water stock). The former method has the advantage of easy disposal of the used nematicide into the soil by removal of the plastic following treatment.

A 600 ppm dipping solution can be made as follows: Zinophos (4 lb/gal), 1.8 oz to 10 gallons of water or ⅔ pint to 60 gallons of water. Dasanit (6 lb/gal), 1⅓ oz. to 10 gallons of water or ½ pint to 60 gallons of water.

Nematodes on *C. elegans* in ground beds of a plant nursery may be controlled by drenching with Zinophos 4-E at rates of ¾ to 1½ pints per 1,000 square feet or Dasanit at rates of 1¼ or 2½ pints per 1,000 square feet in adequate water for uniform coverage (4). Either should be applied as a

3. *Chamaedorea elegans* seedlings cut longitudinally to show the severe internal lesions caused by burrowing nematode.

drenching spray under low pressure. Immediately after treatment the treated area should be sprinkle-irrigated with one acre-inch of water. The purpose of the latter is to wash the chemical from the foliage and to drive it into the soil. Both chemicals are available in granular form. Zinophos in a 10% granular formulation should be applied at a rate of 3 lbs., 10 oz. to 7 lbs., 4 oz. per 1,000 square feet; or Dasanit in a 10% granular form at 10 or 20 lbs. per 1,000 square feet. The granular material is spread evenly over the area to be treated and washed into the soil with one inch of water. BOTH ZINOPHOS AND DASANIT ARE VERY TOXIC (HIGHLY DANGEROUS TO HUMANS) AND ALL PRECAUTIONARY MEASURES LISTED ON THE LABEL SHOULD BE RIGIDLY FOLLOWED.

Anyone applying or working with these materials should use every precaution to prevent breathing, ingesting or spilling either material on skin. Rubber gloves, boots, aprons, and a mask and respirator should be worn. Rub-

Table 1. Nematodes Associated with *Chamaedorea* spp. Expressed in Occurrence per 76 Examinations

	Chamaedorea costaricana	*C. elegans*	*C. erumpens*	*C. seifrizii*	*C. metallica***	*C.* sp.	Total occurrence
Examination	1	44	16	3	1	11	
Criconema sp. (Spine nematode)	-	2	4	-	-	-	6
Criconemoides sp. (Ring nematode)	-	3	4	1	-	3	11
Dolichodorus sp. (Awl nematode)	-	2	-	-	-	-	2
Helicotylenchus sp. (Spiral nematode)	1	9	8	-	-	4	22
Helicotylenchus nannus (Spiral nematode)	-	-	1	-	-	1	2
Hemicriconemoides sp. (Sheathoid nematode)	-	-	1	-	-	-	1
Hemicriconemoides chitwoodi (Sheathoid nematode)	-	-	1	2	-	-	3
Hoplolaimus sp. (Lance nematode)	-	-	1	-	-	-	1
Meloidogyne sp. (Root-knot nematode)	-	7	8	3	-	9	27
Meloidogyne incognita incognita (Root-knot nematode)	-	2	-	-	1	-	3
Meloidogyne incognita acrita (Root-knot nematode)	-	1	-	-	-	-	1
Paratylenchus sp. (Pin nematode)	-	-	1	-	-	-	1
Peltamigratus sp. (Spiral nematode)	1	-	-	-	-	-	1
Pratylenchus sp. (Lesion nematode)	1	6	2	-	-	3	12
Pratylenchus brachyurus (Lesion nematode)	-	1	-	-	-	-	1
Pratylenchus coffeae (Lesion nematode)	-	-	-	2	-	-	2
Radopholus similis (Burrowing nematode)	-	27	1	-	-	1	29
Rotylenchulus sp. (Reniform nematode)	-	1	-	-	-	-	1
Scutellonema sp. (Spiral nematode)	-	-	1	-	-	-	1
Trichodorus sp. (Stubby-root nematode)	-	3	4	1	-	19	27
Tylenchorhynchus sp. (Stunt nematode)	-	1	2	-	-	2	5
Xiphinema sp. (Dagger nematode)	-	2	2	2	-	2	8

**Misidentified in the trade as *C. tenella* Wendl. but recently described as a new species.

ber gloves should be used when handling treated plants within 2 days following treatment. Rubber gloves and boots should be used if contacting treated soil up to 10 days after treatment.

Preventing nematode problems by using plant sanitation procedures is usually easier and more economical than chemically treating a severe nematode problem. Clean seed planted in soil that has been sterilized by dry heat, steam, or chemical treament is the basis for producing nematode free plants. Such plants should be grown when possible in clean containers out of contact with untreated soil.

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The Gold-Plated Imitation Date Tree

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A palm tree recently made newspaper headlines in Orange County, California. While the publicity was not all favorable, it at least focused attention on palms as landscaping specimens of great value — monetarily as well as aesthetically. And plain folks who had thought of palms as "the tall skinny ones" (*Washingtonia robusta*) or "pineapple palms" (*Phoenix canariensis*) now speak knowingly of "reclinatas."

It all came about with the completion of the Angel Baseball Stadium in Anaheim. The stadium is beautifully built, well planned, but became of necessity in deference to the automobile a huge concrete structure surrounded by acres of asphalt parking area. And because people here have become very "landscaping conscious," the Anaheim city fathers knew that something had to be done over and above a few well-placed olive trees and some minimum-maintenance greenery at the entrances.

A fountain was suggested. But a fountain in scale with the stadium would have cost at least $50,000 plus daily maintenance by two men. (It seems people throw lots of things into fountains besides coins.) At this point Dick Kamphefner and Paul Saito of the Anaheim City Park Department stepped into the picture. They had seen large palm groups used effectively in conjunction with major structures and at far less cost than the proposed fountain. Armed with pictures and prices of the *Phoenix reclinata* groups planted at the Los Angeles International Airport, of an enormous *Chamaerops humilis* at Long Beach, and of another *Chamaerops* at Glendale Federal Savings and Loan