

SHORT COMMUNICATIONS

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Effects of Root-knot Nematodes on *Areca catechu*¹

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Abstract: No root galling or egg mass formation was noted on betel palm (*Areca catechu*) 3 or 9 months after inoculation with *Meloidogyne arenaria*, *M. hapla*, *M. incognita* races 1 and 3, or *M. javanica*. Compared with uninoculated controls, a reduction ($P \leq 0.05$) in fresh root weight was noted after 3 months with *M. incognita* race 1 but not with other species or races. No differences ($P \leq 0.05$) in root weight between controls and inoculated plants were observed at 9 months, nor were any differences found in top weight at 3 or 9 months.

Key words: *Areca catechu*, betel palm, host range, *Meloidogyne* spp., palm, pathogenicity, root-knot nematode.

The betel palm (*Areca catechu* L.) is widely grown in the tropics and in Florida as an ornamental, but it is perhaps better known for the betel "nuts" which are chewed in India and other parts of Asia (7). *Areca catechu* is listed as a host of *Radopholus similis* (Cobb) Thorne (4), and *Aphelenchus* sp. is reported from an *Areca* sp. (3). The nematode fauna of *A. catechu* apparently has not been investigated widely, thus making it difficult to anticipate and avoid damage when the palm is to be planted in soil containing plant-parasitic nematodes. Many palms are hosts of *R. similis* (4), but some species, such as the date palm (*Phoenix dactylifera* L.), can be seriously damaged by *Meloidogyne* spp. (6). Previous surveys of palms in Florida have revealed several nematode genera associated with them, including *Meloidogyne* spp. from coconut palms (*Cocos nucifera* L.) in Key West (2,8). The present study was conducted to observe the response of *A. catechu* to root-knot nematodes (*Meloidogyne* spp.), the most damaging group of nematodes on agricultural crops in Florida.

Seeds of *A. catechu* were germinated in a

mist chamber and allowed to grow in nematode-free potting mix for 12-16 weeks. On 14 August 1987 plants were washed free of all debris and bare-root seedlings (ca. 15 cm long) were transplanted into 1.6-liter pots containing steam-sterilized Arredondo fine sand (96% sand, 2% silt, 2% clay; pH 6.1, 1% organic matter). Two plants were transplanted into each pot.

On 3 November plants were inoculated with eggs of *Meloidogyne* spp. extracted (5) in 0.25% NaOCl for 2 minutes from tomato (*Lycopersicon esculentum* Mill. cv. Rutgers). Five separate nematode populations were used in the test: *Meloidogyne arenaria* (Neal) Chitwood race 1, *M. incognita* (Kofoid & White) Chitwood race 1, *M. incognita* race 3, *M. javanica* (Treub) Chitwood, and *M. hapla* Chitwood. Inoculation was accomplished by adding 5,000 eggs of the designated population in 10 ml water to a 2-cm-deep hole at the base of each plant, a total of 10,000 eggs per pot. Uninoculated controls received 10 ml distilled water for each plant. The six treatments (five populations plus control) were arranged on a greenhouse bench in a randomized complete block design with 10 replications.

A plastic saucer beneath each of the 30 pots prevented the flow of water and soil onto the bench. Plants were watered as needed, and each pot was fertilized with 2.5 g of 14-14-14 Osmocote (Sierra Chemical Co., Milpitas, CA) on 29 September

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TABLE 1. Fresh top and root weights of *Areca catechu* at 3 and 9 months after inoculation with *Meloidogyne* spp.

	3 months		9 months	
	Fresh top weight (g)	Fresh root weight (g)	Fresh top weight (g)	Fresh root weight (g)
Uninoculated control	6.3 a	2.6 ab	10.6 a	3.5 a
<i>M. arenaria</i>	6.5 a	2.8 a	13.4 a	4.9 a
<i>M. hapla</i>	4.6 a	1.6 bc	16.2 a	6.2 a
<i>M. incognita</i> race 1	4.1 a	1.2 c	15.3 a	5.1 a
<i>M. incognita</i> race 3	5.0 a	1.9 abc	8.8 a	2.8 a
<i>M. javanica</i>	5.2 a	1.9 abc	10.9 a	3.6 a

Data are means of five replications. Means in columns followed by the same letter are not significantly different ($P \leq 0.05$) according to Duncan's multiple-range test.

and at 3-month intervals thereafter. Heating and cooling facilities were available in the greenhouse to maintain a temperature range of 15–30 C during the course of the test.

Plants from five replications were harvested on 26 January 1988, and fresh top and root weights were determined. Roots were examined for presence of galls and egg masses; then roots of all five replicates of each treatment were combined and eggs were extracted (5) in 1% NaOCl for 4 minutes. A 1-g portion of the roots was stained (1) to facilitate examination for endoparasitic stages of each nematode. The second series of five replications was harvested on 29 July 1988, approximately 9 months after inoculation. Procedures were identical to those used for the harvest at 3 months. Data from each harvest were subjected to analysis of variance.

Viability of the original inoculum was evaluated by adding 5,000 eggs of each population to a 3-week-old tomato plant. Five uninoculated tomato plants were also maintained to detect any root-knot nematodes present in the sterilized soil. Inoculation of the palms and tomato plants took place at the same time. Three months after inoculation, tomato roots were examined for galls and egg masses.

Examination of tomato roots grown in uninoculated soil revealed no galls or egg masses, confirming the initial observation that the steam-sterilized soil was free of *Meloidogyne* spp. Roots of tomatoes inoculated with each root-knot nematode pop-

ulation were heavily galled (> 100 galls and egg masses per root system), indicating that all inoculum was viable and capable of reproducing and causing extensive galling under the conditions of this test. At 3 months, no galling or egg masses were observed on the root system of any inoculated *A. catechu* plant. Microscopic examination of stained roots revealed few nematodes within, and only in one instance was a swollen female (*M. hapla*) observed within roots. Total numbers of eggs extracted from all five root systems were zero for controls and *M. hapla*, four for *M. incognita* race 1, 20 for *M. arenaria*, 620 for *M. javanica*, and 1,680 for *M. incognita* race 3. No differences in top weight were noted, but root weights of plants inoculated with *M. incognita* race 1 were lower ($P \leq 0.05$) than root weights of the controls (Table 1).

At the 9-month harvest, no galls or egg masses were observed on any root system, nor were any stages of *Meloidogyne* spp. observed within roots. No eggs were extracted from any treatment, and no differences ($P \leq 0.05$) in top or root weights were evident (Table 1).

Although some *Meloidogyne* spp. eggs were recovered about 3 months after inoculation, these nematodes failed to sustain reproduction over 9 months on *A. catechu*. An early depression in root weight associated with race 1 of *M. incognita* was not evident later on, and plants appeared to have no lasting effects from inoculation with any of the *Meloidogyne* spp. evaluated. No root galling was observed, whereas in

susceptible palms such as *Phoenix dactylifera*, root galling on seedlings is well documented (6).

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