

RESEARCH NOTES—NOTAS DE INVESTIGACION

PATHOGENICITY OF *SCUTELLONEMA BRACHYURUM* TO *ALOE VERA*

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RESUMEN

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Aloe vera, después de inoculada con *Scutellonema brachyurum* demostró una reducción de peso del follaje seco y húmedo a los 14, 26, y 30 meses. Después de 30 meses de haber sido inoculadas, dos de las plantas murieron. La población de nemátodos se incrementó desde un número inicial de 200 hasta 9994 por tiesto en 8 meses, y después de 30 meses, se redujo a 1196. Quince génera de nemátodos fitoparasíticos se encontraron en con 151 muestras de aloe examinadas.

INTRODUCTION

The genus *Aloe* (family Liliaceae) contains 324 species (7), ranging in height from 5 cm to 15 meters (5). Since antiquity, aloes have been highly valued because of their medicinal properties. In ancient Egypt they were used for embalming and were also recorded from King Solomon's garden (3). Nicodemus brought aloes to prepare the body of Jesus of Nazareth for burial. Curative powers of aloe have been attributed to aloe used in treatment for hair growth, headaches, ringworm, snakebite, sores, sunburn, toothache, venereal disease, X-ray burns (7), and internal parasites. Aloe, native to Africa, has been commercially grown in Florida since 1912.

Fifteen phytoparasitic nematode genera have been recovered from soil associated with aloe plants since 1957 (Table 1). *Scutellonema* sp. was first detected associated with aloe in Florida in 1957. Since 1957 this nematode was found in large numbers in 115 of 151 aloe samples. *Scutellonema brachyurum* (Steiner, 1938) Andrassy, 1958 (Fig. 1) is the only species in the genus that has been identified from aloe. The objective of this investigation was to determine the effect of *S. brachyurum* on the growth of *Aloe vera* (L.) Burm. f.

Table 1. Nematodes found associated with 151 aloe samples collected in Florida (1957-1983).

Nematode/frequency of occurrence	Nematode/frequency of occurrence
<i>Aloe</i> spp. (107 samples)	<i>Aloe brevifolia</i> Mill. (1 sample)
* <i>Scutellonema</i> /89	<i>Aphelenchoides</i> /1
** <i>Meloidogyne</i> /39	<i>Meloidogyne</i> /1
<i>Criconemoides</i> /34	<i>Scutellonema brachyurum</i> /1
<i>Helicotylenchus</i> /25	<i>Aloe vera</i> (43 samples)
*** <i>Rotylenchulus</i> /5	* <i>Scutellonema</i> /25
<i>Pratylenchus</i> /4	<i>Trichodorus</i> /19
<i>Trichodorus</i> /3	**** <i>Meloidogyne</i> /9
<i>Hoplolaimus</i> /3	<i>Helicotylenchus</i> /6
<i>Peltamigratus</i> /3	<i>Criconemoides</i> /5
<i>Tylenchorhynchus</i> /2	<i>Paratylenchus</i> /3
<i>Aphelenchoides</i> /1	<i>Hemicycliophora</i> /1
<i>Tylenchulus semipenetrans</i>	<i>Rotylenchulus</i> /1
Cobb, 1913	<i>Longidorus</i> /1

**Scutellonema brachyurum* included.

***Meloidogyne incognita* (Kofoid & White, 1919), Chitwood, 1949 included.

****Rotylenchulus reniformis* Linford and Oliviera, 1940 included.

*****Meloidogyne javanica* (Treub, 1885) Chitwood, 1949 included.

Table 2. Population densities of *Scutellonema brachyurum* on *Aloe vera*.

<i>Scutellonema brachyurum</i> recovered from inoculated pots	Months following inoculation				
	5	8	14	26	30 ^y
Mean number nematodes per plug	122	269	120	122	34
Estimated mean/pot ^z	4355	9994	4280	4355	1196

^y2 plants died (mean of 4 replications)

^z(Mean soil wt. per pot/mean plug weight) × mean/plug.

MATERIALS AND METHODS

Two hundred *S. brachyurum* females from infested soil of *Aloe* sp. were added to previously steamed soil in four 20-cm clay pots containing nematode-free suckers of *Aloe vera*. Females were counted and then isolated in a water drop in a glass dish. Females were washed from the

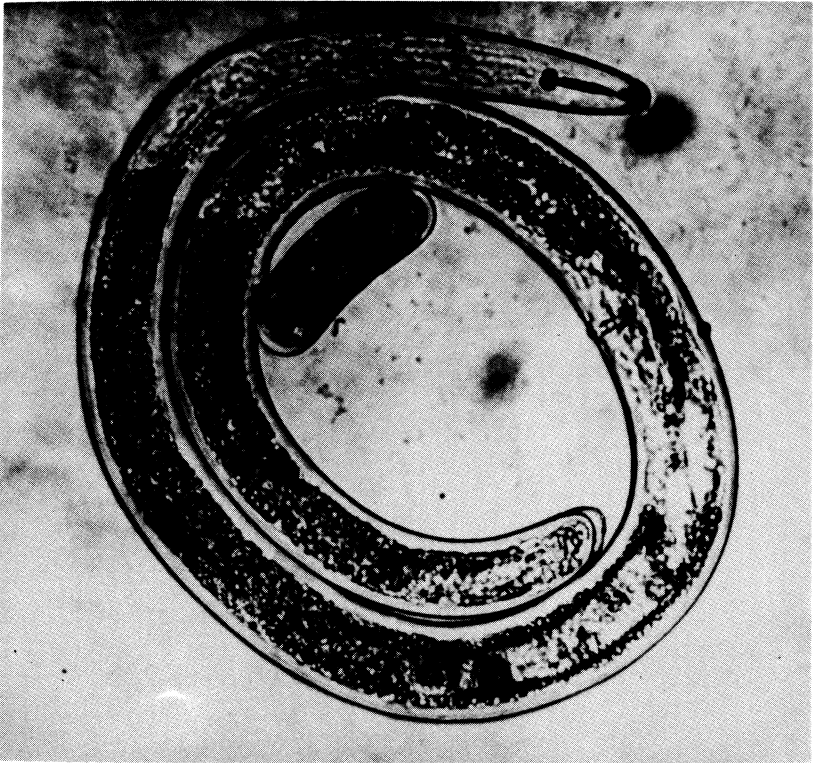


Fig. 1. *Scutellonema brachyurum* female with egg.

Table 3. Effect of *Scutellonema brachyurum* on *Aloe vera* wet and dry leaf weights in grams.

	Time in months			
	9	14	26	30 ^y
<u>Wet wt. means</u>				
Inoculated	803	352	134	12.7 ^z
Uninoculated	524	698	339	80.3
<u>Dry wt. means</u>				
Inoculated	9.1	10.1	14.7	5.4 ^z
Uninoculated	7.3	17.1	19.6	6.7

^yTwo plants died.

^zMean wt. of two surviving plants.



Fig. 1. *Scutellonema brachyurum* female with egg.

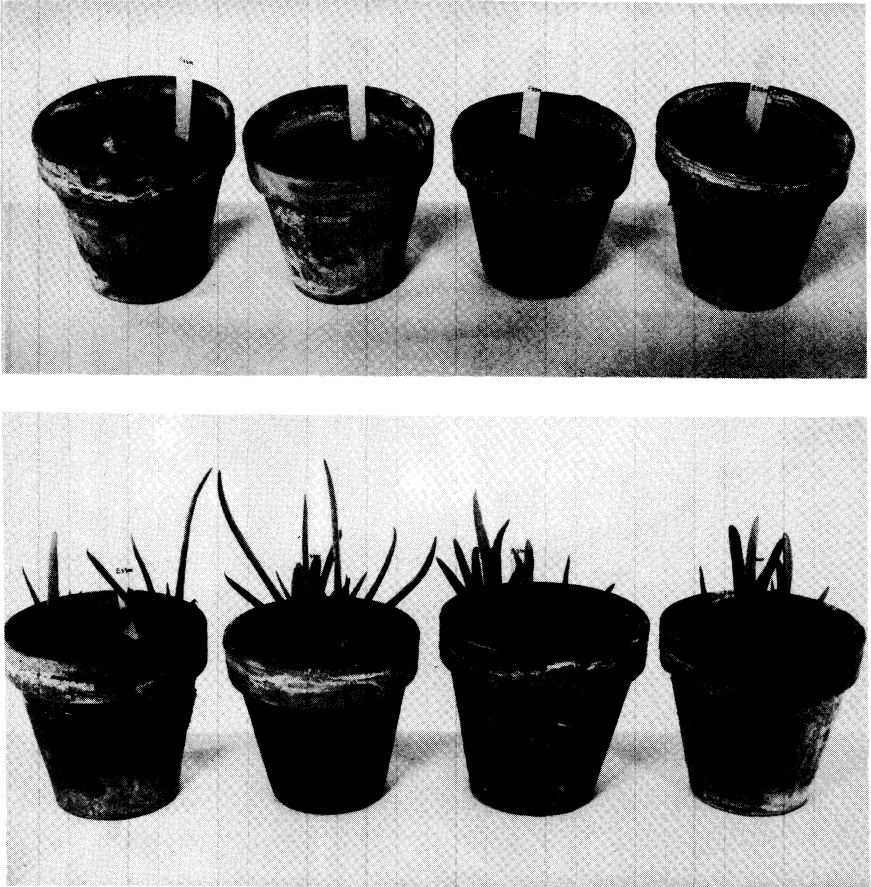


Fig. 2. Thirty months after treatment. Top: Four inoculated aloes (2-dead, center). Bottom: Four uninoculated aloes. DPI negs. 702157-12, 702157-13.

dish into a soil depression in the pot. Four similar noninoculated *Aloe vera* served as checks. The plants were maintained in a glasshouse on benches for the duration of the test.

To estimate the nematode population, three 2×15 cm soil plugs (mean weight 27.6 g) were processed 5 months following inoculation, using the centrifuge technique. In three subsequent assays, only one 2×15 cm plug was examined per pot.

To assess the effect of nematodes on the growth of aloe (four assays), all foliage except 3 small suckers were excised at each plant base. Har-

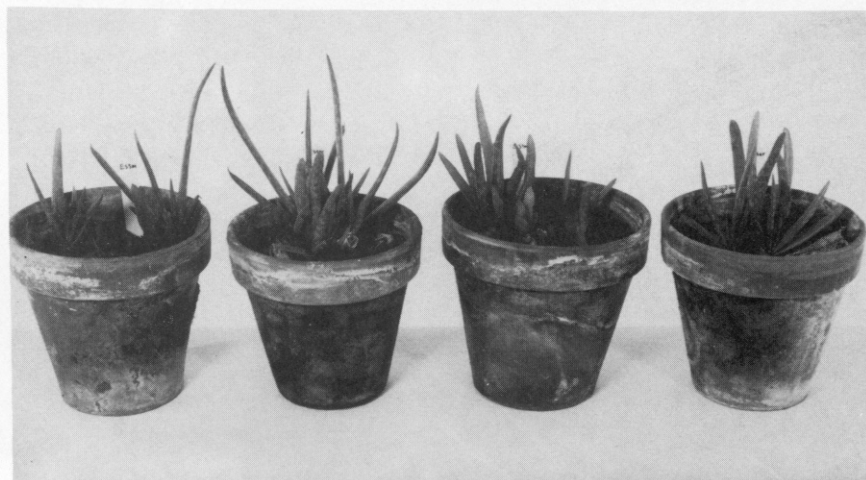


Fig. 2. Thirty months after treatment. Top: Four inoculated aloes (2-dead, center). Bottom: Four uninoculated aloes. DPI negs. 702157-12, 702157-13.

vested leaves were weighed (net weight), then placed in a desiccator until dry (4-8 weeks) and then re-weighed (net dry weight). At the termination of the experiment (30 months), average weight of soil per pot was determined to estimate the nematode population increase.

RESULTS

The population of *S. brachyurum* increased from an initial 200 specimens to a mean of 4353 specimens per pot after 5 months. A high population of 9994 specimens per pot, present 8 months after inoculation, dropped to 1196 members 30 months later (Table 2). No *S. brachyurum* were recovered from the 4 uninoculated pots during the term of the test. The effect of the nematodes on plant weight is shown in Table 3. After 9 months of growth, the leaves of inoculated plants had a greater wet and dry weight than those of the uninoculated controls. In 14, 26, and 30 months following inoculation, the inoculated plants (Fig. 2, top) possessed fewer and smaller leaves than the noninoculated controls (Fig. 2, bottom). As a consequence, the inoculated plants showed a large wet weight reduction at the last 3 harvests (Table 3).

A severe effect of the nematode inoculation was the death of two inoculated plants 30 months following inoculation. The two surviving inoculated plants possessed small, yellow leaves and showed an almost complete loss of tertiary roots (Fig. 3 A,B). Roots were abundant in uninoculated plants (Fig. 3 C,D). Symptoms produced by the nematode infestation included leaf stunting and chlorosis, coarse root, and a decrease in the ability of aloe to recover following leaf harvesting.

DISCUSSION AND SUMMARY

Reports of *S. brachyurum* pathogenicity have been quite variable. Ruehle (8) found root growth of *Pinus palustris* to be stimulated by a high nematode inoculum level. Little or no effect by *S. brachyurum* was shown in pathogenicity tests with red clover (1) or sycamore (2). Slight damage was caused by the pest to amaryllis (6). Graham (4) inoculated tobacco with *S. brachyurum* resulting in a root and top weight reduction.

In this study, *S. brachyurum* populations flourished on *Aloe* until many tertiary roots were destroyed, at which time the population declined (Table 2). The reduction of wet weights in *Aloe vera* in the presence of *S. brachyurum* (Table 3) is more economically meaningful than the dry weight reduction since the thick, succulent leaves containing a liquid medicinal product constitute the economic resource of the plant.

Fifteen genera of phytoparasitic nematodes were found associated with 151 *Aloe* spp. collected since 1983 (Table 1). *Scutellonema* spp. was

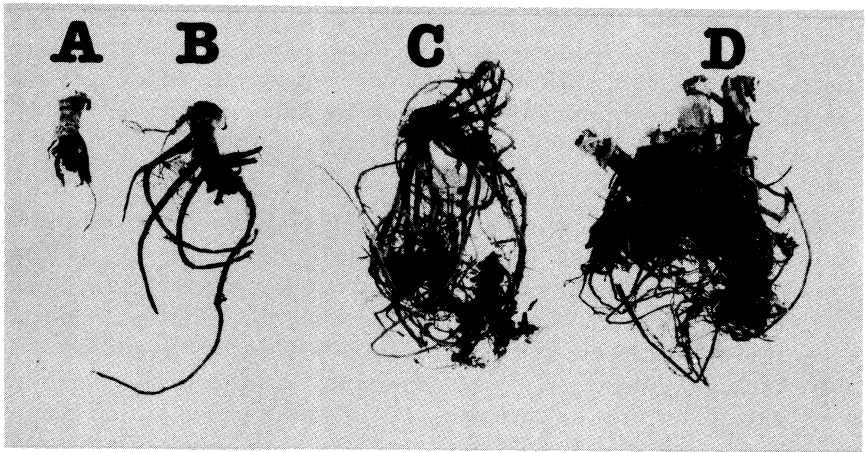


Fig. 3. Effect of *Scutellonema brachyurum* on roots. A,B. Roots from 2 surviving inoculated plants. C,D. Roots from 2 uninoculated plants. DPI neg. #702169.

most prevalent, occurring in 76% of the samples, followed by *Meloidogyne* spp. in 32%, and *Criconemoides* spp. in 26% of the samples.

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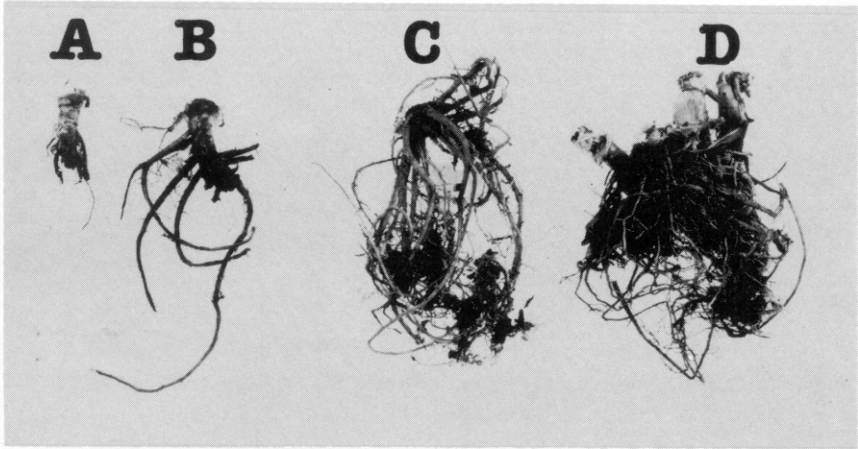


Fig. 3. Effect of *Scutellonema brachyurum* on roots. A,B. Roots from 2 surviving inoculated plants. C,D. Roots from 2 uninoculated plants. DPI neg. #702169.

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