number of qualified experts on the identification of various groups of insects. There has developed a belief by the general public, and even within some of the scientific community, that the basic work of describing and classifying the insects and other arthropod species of the world has been virtually completed. Unfortunately, this is far from the truth. While close to a million species of arthropods have been described . . . more than all the other species of animals in the world from protozoa to the chordates . . . systematic entomologists estimate that considerable less than half of the world's arthropod species have been described. Species are being lost from the face of the earth in substantial numbers, due mainly to man's destruction of their habitats. This is especially true in the tropical and subtropical areas where rain forest and other unique habitats are being destroyed at an incredible rate since the introduction of the chain saw and other modern machinery. Many species of arthropods are being lost before we even know of their existence, some of which could have practical applications for the benefit of man. It should be remembered that comparatively few species of insects and other arthropods are pest species from man's viewpoint.

We have much to learn about the life histories, host relationships, distribution, behavior, and ecology of our arthropod fauna. There is a continuing need for basic research to lay the foundation for applied research, and we need to be continuing the training of systematists to help provide fundamental information. In recent years Florida has recognized this need and has begun to provide leadership toward this end. The newly created Center for Systematic Entomology, Inc. seeks to provide this sort of support. Florida agriculture and consumer services stand to benefit substantially.

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MIGRATION, SURVIVAL, AND REPRODUCTION OF NEMATODES IN ROCKWOOL

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Abstract. **Experiments were conducted in which known quantities of root-knot nematode, *Meloidogyne incognita* (Kofoid & White) Chitwood, and soybean cyst nematode, *Heterodera glycines* Ichinohe, were injected into rockwool, and their migration, survival, and reproduction were evaluated the six times during a 3-month period. Over a period of weeks, the nematodes introduced into rockwool blocks contaminated uninoculated rockwool slabs. The potential of root-knot and cyst nematodes to survive in rockwool in the absence of a host is similar to that in soil or organic soil-less media. *Heterodera glycines* survived in the absence of a host for 3 months. If a host is present, the potential for nematode reproduction in rockwool medium is similar to that in soil or organic soil-less type medium.**

Rockwool, an inert fiberous material primarily used for insulation, is now used as a substrate for growing plants. In Florida, the use of rockwool has increased in the past few years, especially for aquatic plants and greenhouse-grown vegetables. In Florida's ornamental industry, the utilization of rockwool is primarily in the experimental phase (3).

The use of rockwool as a medium for growing plants began about 20 years ago in Denmark as a substrate for hydroponics. In northwestern Europe, the utilization of rockwool as a horticultural medium has expanded rapidly, and it is estimated that 50% of all greenhouse-grown vegetables are grown in rockwool (1). Its use has also spread to ornamental crops, especially floricultural crops. Besides the merits of rockwool as a cultural substrate, there are economic and regulatory reasons for its increased use in Europe. Escalating peat prices, coupled with high costs of soil sterilization forced growers to examine other alternatives. Furthermore, because of the risks of introducing pests, the United States and many other countries do not permit routine importation of plants grown in soil or any soil-based medium. Therefore, as a means to broaden their export markets, European growers have requested that the United States relax their regulations to permit the importation of plants grown in rockwool, as well as certain other types of soil-free media. There is, however, very limited or almost no information on the movement, survival, and reproduction of nematodes in rockwool, yet this information is essential for assessing the risks of introducing contaminant pests, if plants growing in rockwool are permitted to be imported. The objective of this study was to provide risk assessment information by 1) evaluating migration of plant parasitic nematodes in rockwool resulting either from their passive movement during watering, or the active movement of their motile life stages, 2) comparing nematode survival in soil and rockwool in the absence of a host, and 3) comparing nematode reproduction on hosts grown in rockwool with that on plants grown in other media.

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Materials and Methods

Nematode migration. To study the extent of nematode migration during watering, 1000 second-stage juveniles (J2) of *Meloidogyne incognita* or *Tylenchulus semipenetrans* Cobb, were injected into the center core of 14-cm-d and 7-cm thick rockwool cylinders. Subsequently, 1 liter or 10 liters of water was added to the cylinders and then the vertical and horizontal movement of the nematodes was evaluated by dividing the cylinder into 18 sectors, and extracting the nematodes from each sector (Fig. 1). The water that leached through the cylinder was also checked under a stereomicroscope for the presence of nematodes after vacuum filtering it through a 0.8-μm membrane and rinsing the contents caught on the membrane into a counting dish. The sectors from the cylinder were placed on a Baermann funnel, and the nematodes recovered after 72 hours were counted.

Nematode survival. Survival of root-knot nematode, *Meloidogyne incognita,* and soybean cyst nematode, *Heterodera glycines,* was compared in soil and rockwool at six time intervals during a 12-week period. Rockwool blocks (10 x 10 x 6.5 cm) were placed on rockwool slabs (15 x 90 x 7.5 cm). To reduce algal growth, the slabs were covered with white plastic, except at the 8 locations on each slab where the blocks were placed. The soil-mix, consisting of a 3:2:1 mixture of sandy loam, coarse sand, and perlite, was placed in plastic pots (9 x 9 x 7.5 cm). Inoculum was distributed at five sites in the soil or rockwool block at a depth of 3 cm. Inoculum levels per 100 cc of soil-mix or rockwool were: 1000 *M. incognita* juveniles in Expt. 1, 1000 *H. glycines* J2 in Expt. 2, and 100 cysts of *H. glycines* in Expt. 3. Each pot or block was watered twice daily with a single laminar flow emitter for 1 min (ca. 63 ml/min). Greenhouse temperatures ranged from 20 to 30° C. After the nematode infested media had been in the greenhouse for 0, 2, 4, 6, 8, and 12 weeks without a host, 100-cm³ samples were removed from each of four pots and four rockwool blocks. A 30-cm³ rockwool sample was cut from the uninoculated slab below each sampled inoculated block. Samples were placed on Baermann funnels for 72 hours to extract nematodes surviving in the soil and rockwool. At the same time, the samples were placed on funnels, an additional nematode survival test was initiated by planting bioassay hosts in the inoculated soil-mix and four remaining blocks. Tomato, *Lycopersicon esculentum* Mill. cv. Rutgers and soybean, *Glycine max* Merrill cv. Lee, were used to detect J2 of *M. incognita* and *H. glycines,* respectively. Bioassay hosts were also planted in the slab where the blocks were removed to detect if nematodes had moved from inoculated blocks into uninoculated slabs. After 8 weeks, the number of root galls, the number of *M. incognita* egg masses, eggs per tomato bioassay plant, and the number of cysts per soybean bioassay plant were determined. Because of the physical structure of rockwool, many small roots, cysts, and egg masses remained in this medium when root systems were removed from it. Therefore, cysts and eggs were also extracted from the rockwool. Eggs were extracted from rockwool using the same NaOCl standard method that was also used for extracting eggs from egg masses on roots (2). To estimate the number of cysts in the rockwool, a 10% subsample by weight was placed on a 20 mesh sieve (850 μm opening), and the cysts were separated from the rockwool with high water pressure and caught on a 60 mesh sieve (250-μm opening).

Nematode reproduction and pathogenicity. Three greenhouse experiments were conducted to compare nematode reproduction and pathogenicity of *M. incognita* and *H. glycines* on plants growing in rockwool, in a soil based medium, and an organic based medium. The organic-based medium was a commercially prepared Metro-500 mix containing Canadian sphagnum peat moss, vermiculite, composted pine bark, processed ash, and granitic sand. The soil-based mix was prepared as described previously, and the rockwool blocks and slabs and the plastic pots were the same dimensions as those described in the nematode survival experiments. Hosts for root-knot nematode reproductive experiments were *Schefflera arboricola* and *Calathea orbiculata.* Twelve *Schefflera* seedlings and 12 *Calathea* plants from tissue culture propagation were trans-

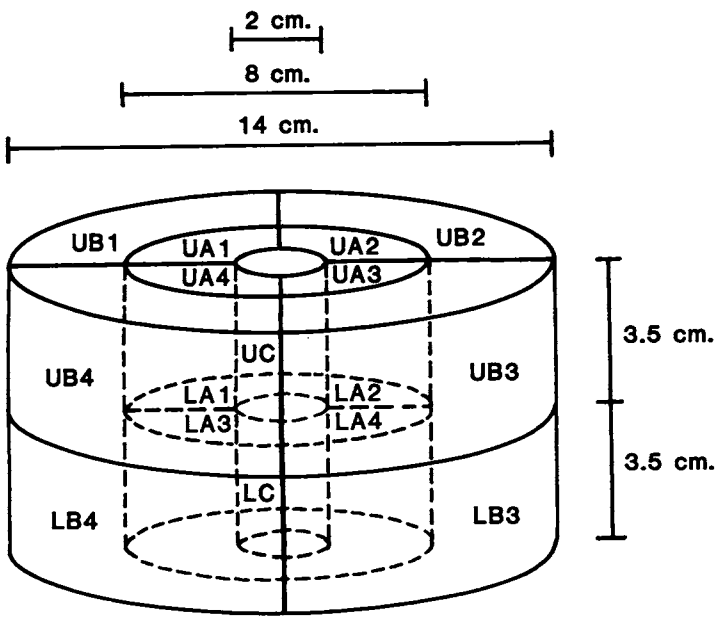

Fig. 1. Design and dimensions of rockwool cylinders used to study the passive horizontal and vertical migration of nematodes with watering after 1000 nematodes were injected into the center of the upper core (UC). (18 sectors: UC = upper center core; LC = lower center core; UA = 4 upper inner sectors; UB = 4 upper outer sectors; LA = 4 lower inner sectors; and LB = 4 lower outer sectors). (Sectors LB_1 and LB_2 are not shown, but are located behind LB_3 and LB_4 in the lower half of the cylinder).

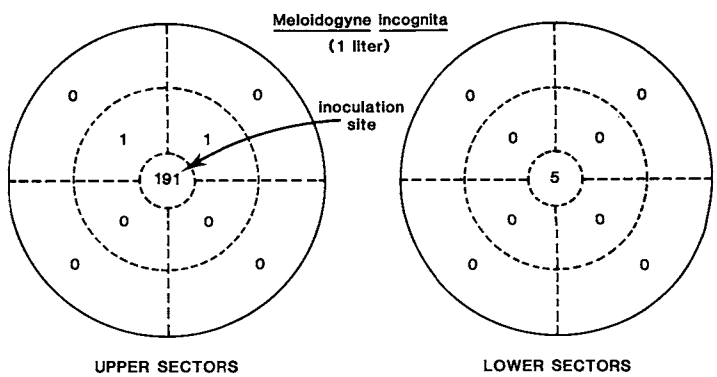

Fig. 2. Distribution of *Meloidogyne incognita* second stage juveniles that were recovered by Baermann funnel extraction after 1 liter of water was addded to the rockwool cylinder.

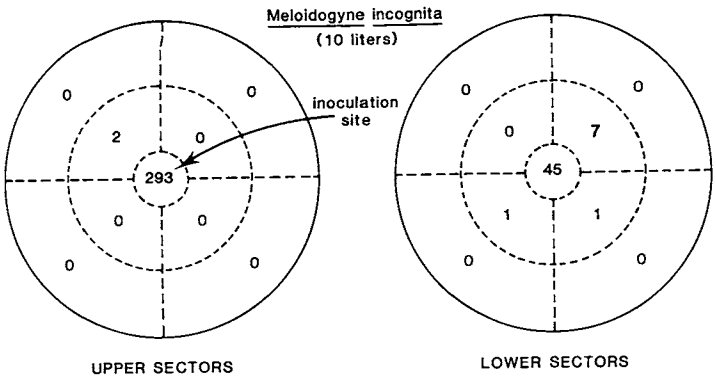

Fig. 3. Distribution of *Meloidogyne incognita* second stage juveniles that were recovered by Baermann funnel extraction after 10 liters of water were added to the rockwool cylinder.

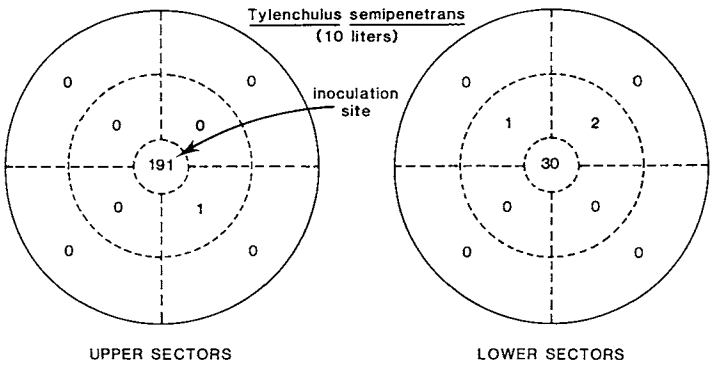

Fig. 4. Distribution of *Tylenchulus semipenetrans* second stage juveniles that were recovered by Baermann funnel extraction after 10 liters of water were added to the rockwool cylinder.

planted into each of the growing media. One half of the experimental plants were inoculated with 40,000 *M. incognita* J2 per plant at eight sites surrounding the transplants, and the remaining plants were the uninoculated control plants. Every other rockwool block on the rockwool slab was inoculated. Six plants in each medium were inoculared and there were six uninoculated replications. Plant height and width, and number of leaves per plant were recorded at 6, 8, 10, and 12 weeks after inoculation. The *Schefflera* and *Calathea* plants were harvested at 13 and 16 weeks, respectively, after inoculation. At harvest, fresh and dry

Table 1. Survival of nematodes in the absence of a host in rockwool and soil-mix growing media, based on the number of live juveniles extracted with the Baermann funnel at various time intervals after inoculation.

Type of inoculum[z] and growing medium	Nematodes recovered/100 cm³of Medium[y]					
	Weeks					
	0	2	4	6	8	12
Meloidogyne incognita (J2)						
Rockwool blocks	458 a	1 a	1 a	0 a	0 a	0 a
Rockwool slabs[x]	1 c	2 a	1 a	0 a	0 a	0 a
Soil-mix	160 b	3 a	0 a	1 a	0 a	0 a
Heterodera glycines (J2)						
Rockwool blocks	208 a	38 ab	8 b	5 b	1 b	0 a
Rockwool slabs[x]	0 c	81 a	44 a	20 a	16 a	0 a
Soil-mix	113 b	16 b	0 c	1 c	1 b	1 a
Heterodera glycines (cysts)						
Rockwool blocks	44 a	8 a	2 a	1 a	1 b	1 a
Rockwool slabs[x]	0 c	1 b	6 a	1 a	0 b	0 a
Soil-mix	19 b	12 ab	3 a	1 a	5 a	1 a

[z]Inoculum levels for the rockwool block medium or soil-mix growing medium: 1000 second stage *M. incognita* juveniles (J2)/100 cm³; 1000 *H. glycines* (J2)/100 cm³; or 100 cysts/100 cm³. (Mean # of eggs per cyst was approximately 86).
[y]Values within a given column for a given nematode followed by the same letter are not significantly different at the 5% level by the Waller-Duncan test. Data transformation square root of (x + 0.5) was used for statistical analysis. Mean four replications.
[x]Inoculated rockwool blocks were placed on nematode-free slabs. Nematodes recovered from the slabs moved from inoculated blocks either due to active movement of juveniles or passive movement during watering.

shoot and root weights were obtained. Numbers of galls, egg masses, and total egg numbers were recorded for each plant. In the third experiment, the reproduction of *H. glycines* on 'Lee' soybean in each of the three media was compared. Five thousand of *H. glycines* J2 were added to each inoculated plant. In each medium there were six inoculated plants and six uninoculated check-plants. Plant top weight and number of cysts per plant were determined 9 weeks after inoculation.

Results and Discussion

Nematode migration. The distribution of *M. incognita* juveniles after watering the cylinders with 1 and 10 liters and

Table 2. Survival or root-knot nematode, *Meloidogyne incognita*, in the absence of a host plant after second stage juveniles were added to rockwool and soil-mix growing media based on gall index, egg-mass index, and number of eggs recovered from tomato bioassay plants 8 weeks after planting.

Time nematodes were in growing medium before bioassay host was planted.[y]	Rockwool block assay plants							Slab assay plants[x]			Soil assay plants		
	Block roots			Slab roots[x]									
	Gall[z] index	Egg-mass index	Number of eggs	Gall index	Egg-mass index[z]	Number of eggs	TOTAL eggs	Gall index[z]	Egg-mass index[z]	Number of eggs	Gall index[z]	Egg-mass index[z]	Number of eggs
0 weeks	2.0	1.3	12,382	2.5	2.3	23,442	35,824	1.0	1.0	1,750	4.8	4.9	393,419
2 weeks	0.5	0.3	520	0.3	0.3	800	1,320	2.3	1.0	0	5.0	3.8	79,200
4 weeks	0	0	0	0	0	0	0	0	0	0	1.0	1.0	280
6 weeks	0	0	0	0	0	0	0	0	0	0	1.0	1.0	920
8 weeks	0	0	0	0	0	0	0	0	0	0	0	0	0
12 weeks	0	0	0	0	0	0	0	0	0	0	0	0	20

[z]Gall index and egg mass index: 0 = 0; 1 = 1-2; 2 = 3-10; 3 = 11-30; 4 = 31-100; 5 = 100⁺ galls or egg-masses/plant.
[y]Inoculum level/100 cm³ of rockwool block or soil-mix growing medium was 1000 *M. incognita* juveniles/100 cm³, replicated four times.
[x]Inoculated blocks were placed on nematode free slabs. Nematodes recovered from the slabs moved from the inoculated blocks either due to active nematode movement or their passive movement during watering.

Tylenchulus semipenetrans (citrus nematode) after watering with 10 liters is shown in Figures 2, 3, and 4, respectively. No nematodes were found in the water that leached through the cylinders. Very similar results were obtained for both nematodes. After the cylinders were watered (10 liters), 84% to 85% of the nematodes remained in the zone where they were injected. Approximately 13% moved into the zone directly below where they were injected, and 2% to 3% moved horizontally and/or diagonally into lateral zones. These studies indicate that nematodes are not readily leached out of rockwool. Nevertheless, with long term watering, there could be significant cross-contamination, especially if rockwool slabs are used. The extent of this contamination was also evaluated as a part of other experiments on nematode survival and reproduction.

Nematode survival. Meloidogyne incognita J2 survived 4 weeks in rockwool and 6 weeks in soil, without a host in the greenhouse, based on live nematodes that were recovered on the Baermann funnel (Table 1). In the bioassay test, live *M. incognita* J2 were detected in rockwool for 2 weeks and in soil for 6 weeks after juveniles had been inoculated into host free media (Table 2).

In rockwool and soil-mix media *H. glycines* J2 survived longer than *M. incognita* J2 without a host. When juveniles

Table 3. Survival of soybean cyst nematode, *Heterodera glycines*, in the absence of host plants after second stage juveniles or cysts were added to rockwool and soil-mix growing media. Frequency of detection (FD) and number of yellow cysts detected on soybean bioassay plants 8 weeks after they were planted.

Time nematodes were in growing medium before bioassay host was planted	Block assay plants					Slab assay plants[z]		Soil assay plants	
	Block roots		Slab roots						
	FD[y]	Cysts	FD	Cysts	Total	FD	Cysts	FD	Cysts
Inoculation with 1000 juveniles[x]									
0 weeks	(4/4)	1,150	(4/4)	910	2,060	(2/4)	90	(4/4)	110
2 weeks	(1/4)	2	(3/4)	23	25	(4/4)	313	(4/4)	10
4 weeks	(1/4)	8	(3/4)	10	18	(4/4)	20	(1/4)	1
6 weeks	(1/4)	3	(0/4)	0	3	(3/4)	40	(0/4)	0
8 weeks	(2/4)	3	(3/4)	28	31	(3/4)	20	(2/4)	1
12 weeks	(1/4)	35	(1/4)	13	48	(0/4)	0	(0/4)	0
Total:	(10/24)	1,201	(14/24)	984	2,185	(16/24)	483	(11/24)	121
Inoculation with 100 cysts[x]									
0 weeks	(3/4)	78	(4/4)	73	151	(1/4)	58	(3/4)	23
2 weeks	(1/4)	2	(2/4)	17	19	(3/4)	2	(4/4)	68
4 weeks	(2/4)	25	(4/4)	33	58	(3/4)	15	(4/4)	15
6 weeks	(1/4)	2	(3/4)	8	10	(1/4)	5	(4/4)	7
8 weeks	(2/4)	15	(4/4)	80	95	(3/4)	8	(4/4)	14
12 weeks	(0/4)	0	(4/4)	15	15	(0/4)	0	(4/4)	23
Total:	(9/24)	122	(21/24)	226	348	(11/24)	88	(23/24)	150

[z]Inoculated blocks were placed on nematode-free slabs. Yellow cysts recovered from roots in slabs represent active movement of juveniles from inoculated blocks or their passive movement during watering.
[y]Frequency of detection or number of detections in four replications.
[x]Inoculum levels are /1)) cm^3 of rockwool or soil-mix. *H. glycines* cysts containing approximately 86 egg/cyst.

Table 4. Nematode reproduction on hosts grown in rockwool, a soil-mix, and an organic based medium.

Host and type of nematode inoculum/nematode reproduction parameter[z]	Rockwool		Soil-mix		Metro-mix	
	Inoculated	Uninoculated	Inoculated	Uninoculated	Inoculated	Uninoculated
Schefflera : *M. incognita*[y]						
Galls/plant	47[x]	21	29	0	45	0
Gall index	3.6	1.7	3.0	0	3.8	0
Egg mass index	0.7	0	0.8	0	0.5	0
Eggs/plant	180	18	270	0	402	0
Calathea : *M. incognita*[y]						
Galls/plant	8	1	10	0	8	0
Gall index	0.8	0.8	2.2	0	1.7	0
Egg mass index	0.8	0.7	1.8	0	1.7	0
Eggs/plant	1400	137	1646	0	2580	0
Soybean : *H. glycines*[y]						
Cysts/plant	105	17	49	0	40	0

[z]Gall and egg mass index: 0 = 0; 1 = 1-2; 2 = 3-10; 3 = 11-30; 4 = 31-100; 5 = 100+ galls or egg-mass/plant.
[y]Each *Schefflera arboricola* and *Calathea orbiculata* plant was inoculated with 40,000 *Meloidogyne incognita* second stage juveniles, and each soybean plant, *Glycine max* 'Lee', was inoculated with 5000 *Heterodera glycines* juveniles.
[x]Data are means of six replications. Data for *Schefflera* taken at 13 weeks, *Calathea* at 16 weeks, and soybeans at 9 weeks after inoculation.

were used as inoculum, live *H. glycines* J2 were extracted from rockwool by the Baermann funnel, after they were in rockwool 8 weeks without a host. When cysts were used as inoculum, live J2 of *H. glycines* were recovered from rockwool and soil after they were in these media for 12 weeks without a host (Table 1). Tomato bioassay plants grown in soil had higher *M. incognita* populations than plants grown in rockwool, whereas soybean bioassay plants had highter *H. glycines* populations in rockwool than in soil (Table 2, 3).

Results from funnel extractions and bioassay hosts planted in that area of the slabs where the inoculated blocks were prior to removal, both indicated that *M. incognita* J2 moved from the inoculated blocks into the uninoculated slabs below them (Tables 1, 2). Separate observations were also made on roots that grew from the inoculated blocks into the uninoculated slab below the blocks. These roots became infected, and this also confirmed that nematodes migrated from inoculated blocks and contaminated the uninoculated rockwool slabs (Table 2). *H. glycines* juveniles also readily moved from inoculated blocks into the uninoculated slabs. From 2 to 8 weeks, more nematodes were recovered from the slabs than from inoculated blocks (Table 3). Although watering experiments indicated that nematodes are not readily dispersed in rockwool during a given routine watering of plants, results from the survival experiments indicate that, with time, significant nematode migration may occur in rockwool due to the accumulative passive dispersion of nematodes during watering and the active migration of motile nematode life-stages.

Nematode reproduction and pathogenicity. Galls and egg masses of *M. incognita* were observed on roots of *Schefflera* and *Calathea* plants in rockwool (Table 4, Fig. 5A). *Meloidogyne* reproduction on plants grown in rockwool was similar to that on plants grown in Metro and soil-mix media (Table 4). Growth differences between inoculated and uninoculated plants in the Metro and soil-mix media were significantly greater than in rockwool (Table 5) (Fig. 5B, C). Observations on the number of galls and eggs from roots in inoculated and uninoculated blocks showed that the nematodes moved from the inoculated blocks into the uninoculated slabs, and roots of the uninoculated plants in the slab became infected, which may have reduced the growth of uninoculated plants in rockwool (Tables 4, 5).

A greater number of *H. glycines* reproduced on soybeans grown in rockwool than in Metro-mix or soil-mix medium (Table 4). In rockwool, cysts were recovered from roots of 50% of the uninoculated plants, especially from roots growing into the slab adjacent to the uninoculated blocks. About 94% of the total number of cysts recovered from the rockwool were found in the slab which initially was free of nematodes. Growth of soybean plants inoculated with *H. glycines* was not significantly different from uninoculated plants in the three media.

In conclusion, our experiments have shown that nematodes have the potential to reproduce on hosts in rockwool. In the absence of a host, rockwool can serve as a carrier for nematode contaminants, since cyst and root-knot nematodes may survive in this medium for many weeks. With time, nematodes may move significant distances in rockwool or even into the environs. Furthermore, in our experience, it is more difficult to sample and extract nematodes from rockwool than from soil. These facts, and the fact that nematodes have similar capacities to move, survive, and reproduce in soil-based, organic-based, or rockwool media, should be considered when regulatory agencies assess the risks of introducing contaminant pests with plants grown in rockwool.

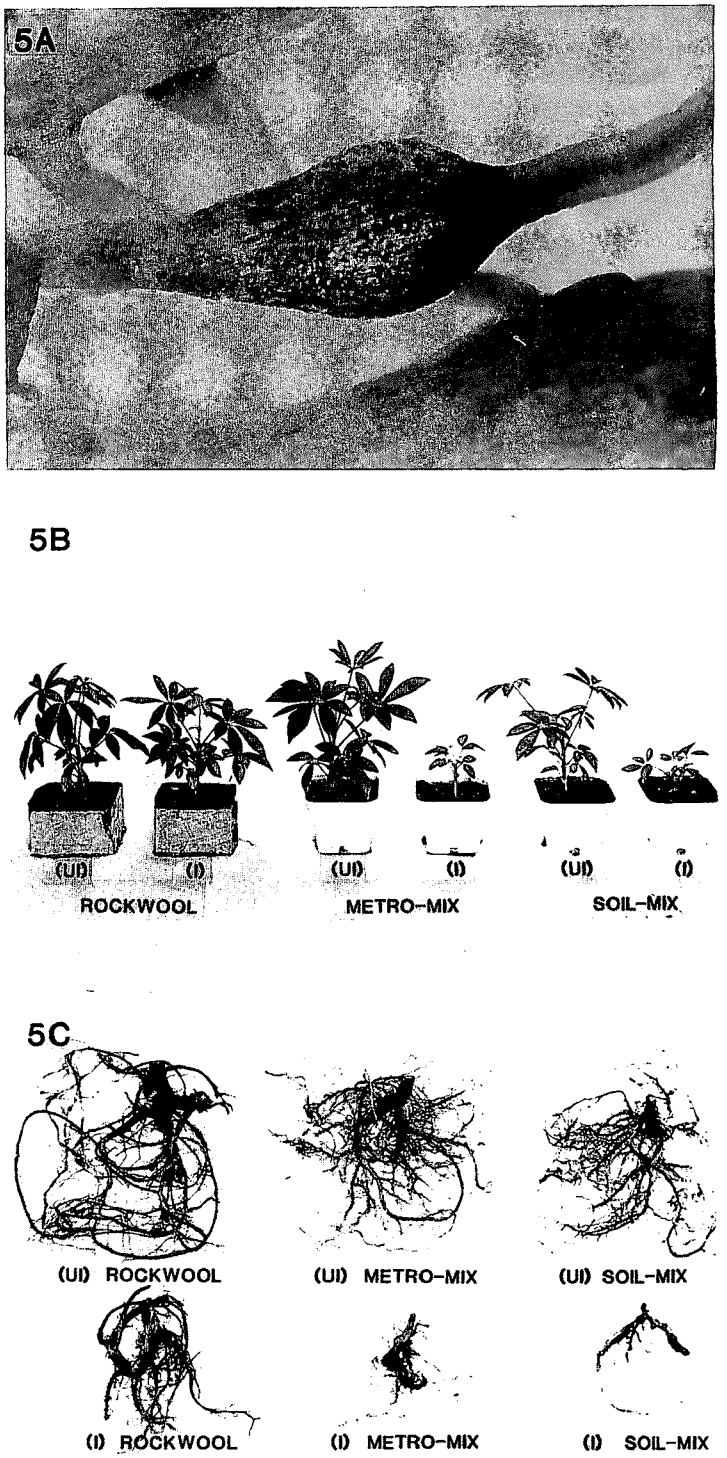

Fig. 5. Effect of root-knot nematode, *Meloidogyne incognita*, on growth of *Schefflera arboricola* grown in rockwool, Metro-500, and soil-mix media. A. close up of gall on root of *Schefflera* in uninoculated slab that became contaminated with nematodes which moved from inoculated blocks. B. Effect on top growth; (UI) = uninoculated, (I) = inoculated plants. C. Effect on root growth.

Table 5. Response of plants inoculated (I) with nematodes compared to uninoculated (UI) plants grown in rockwool, soil-mix, and organic based media.

Host and type of Nematode inoculum/ growth parameters	Rockwool		Soil mix		Metro-Mix	
	I	UI	I	UI	I	UI
Schefflera : *M. incognita*[z]						
Plant height (cm)						
6 weeks	10.0 ab[y]	10.9 ab	5.8 d	9.1 bc	7.3 cd	11.2 a
8 weeks	12.4 a	13.8 a	6.3 b	11.8 a	8.4 b	13.7 a
10 weeks	13.7 a	15.2 a	8.5 b	13.9 a	7.6 b	14.0 a
12 weeks	14.7 ab	16.3 a	6.8 a	13.1 bc	10.5 c	16.1 ab
Plant width (cm)						
6 weeks	15.8 bc	17.1 ab	7.1 e	13.9 c	10.5 d	18.7 a
8 weeks	18.8 ab	19.9 a	6.9 d	16.4 b	10.8 c	20.2 a
10 weeks	18.7 a	19.8 a	9.5 b	17.9 a	9.1 b	17.5 a
12 weeks	23.2 a	22.9 ab	8.5 d	19.0 bc	15.6 c	23.9 a
Number of leaves						
6 weeks	10.5 a	10.5 a	7.5 b	10.3 a	6.8 b	10.3 a
8 weeks	12.0 ab	12.3 ab	5.8 d	10.7 b	8.5 c	12.7 a
10 weeks	11.8 a	12.1 a	5.6 c	10.0 b	8.7 b	12.0 a
12 weeks	14.0 a	14.5 a	6.3 c	11.8 b	10.2 b	15.5 a
Top fresh wt (g)						
13 weeks	13.8 b	18.8 a	1.7 d	8.3 c	5.0 c	17.5 ab
Top dry wt (g)						
13 weeks	2.17 b	2.89 a	0.25 d	1.26 c	0.71 cd	2.82 ab
Root fresh wt (g)						
13 weeks	8.3 a	8.2 a	1.5 c	5.0 b	3.0 bc	9.7 a
Root dry wt (g)						
13 weeks	0.78 a	0.76 a	0.13 c	0.44 b	0.23 c	0.85 a
Calathea : *M. incognita*						
Top fresh wt (g)	10.2 d	15.2 bcd	12.7cd	17.5bc	19.2ab	23.3a
Top dry wt (g)	1.12 c	1.50 abc	1.26 bc	1.57 abc	1.66 ab	1.19 a
Root fresh wt (g)	8.2 a	8.9 a	8.0 a	8.5 a	8.8 a	8.2 a
Root dry wt (g)	1.17 ab	1.32 a	0.87 bc	1.00 bc	0.78 c	0.81 c
Soybean : *H. glycines*[z]						
Top fresh wt (g) at harvest	10.5 a	13.2 a	8.8 b	9.9 b	11.4 ab	9.0 b
Top dry wt (g) at harvest	2.5 ab	3.5 a	2.0 b	2.6 b	2.6 ab	2.3 b

[z]Each *Schefflera* and *Calathea* plant was inoculated with 40,000 *Meloidogyne incognita* second stage juveniles, and each soybean plant, *Glycine max* 'Lee', was inoculated with 5000 *Heterodera glycines* juveniles.
[y]Data the mean of six replications. Values for a given parameter in the same row followed by the same letter are not significantly different at the 5% level by the Waller-Duncan test.

Literature Cited

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