

SOME OBSERVATIONS ON THE HOST PLANT RELATIONSHIPS OF *RADOPHOLUS SIMILIS* IN NATAL [ALGUNAS OBSERVACIONES SOBRE LAS RELACIONES DE PLANTAS HOSPEDERAS DEL *RADOPHOLUS SIMILIS*].  
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### ABSTRACT

In an endeavor to find alternate crops for soils infested with *Radopholus similis*, over 100 plant species were tested for susceptibility to the banana strain of this nematode. Approximately 40 plant species, including certain vegetables, fruit trees, grasses and ornamentals, were found to be non-hosts of *Radopholus*. Resistant crops of value included pineapples, papaya, passion fruit (*Passiflora edulis*), sweet potato, litchi and radishes. *Tagetes patula* also reduced the population of *Radopholus*. Coffee plants were found to be highly susceptible to *Radopholus* attack.

### INTRODUCTION

The burrowing nematode, *Radopholus similis*, is almost totally absent from the main banana producing areas of the Transvaal, but it is very prevalent in the coastal growing areas of Natal, where over 1000 ha are infested with this nematode (1, 2). A farm heavily infested with *R. similis* was rented by the South African Department of Agricultural Technical Services to evaluate various plants for their suitability as hosts of this nematode, and to carry out other supplementary trials.

### MATERIAL AND METHODS

**A. Host plant trials:** Between 1971 and 1974, seed or *R. similis*-free seedlings of species of plants (Tables 1 to 3), were planted in the root zone of Dwarf Cavendish banana plants severely infested with *R. similis*. Once the plants were considered to have been exposed to the *R. similis* infestation for a sufficient period, usually until the plants had attained maturity, the first root samples were taken. Root samples were then collected from each crop under test at fortnightly intervals over a period of 4 wks unless otherwise indicated.

All root samples were washed in tap water to remove soil and detritus, thereby eliminating the possibility of the roots being superficially contaminated with the nematode. The roots were then processed for 48 hrs in a Seinhorst mistifier. On the basis of visible root damage and the number of *R. similis* per g of dry root tissue, the plants were placed in one of the following three classes:

**Good host** — root damage clearly visible and increased in severity with time. Successively higher numbers of *R. similis* recovered from the roots with each sample collected.

**Poor host** — no or very little root damage apparent and unrelated to the numbers of burrowing eelworm recovered. The numbers of *R. similis* extracted from the roots were low and did not markedly or consistently increase between sampling dates.

**Non-host** — plants from whose roots no *R. similis* were recovered and whose root systems and growth appeared unaffected by the nematode.

**B. Rotation trial:** A small, unreplicated rotation trial was established on 66 m<sup>2</sup>

Table 1. Plants that are non-hosts of the banana race of *Radopholus similis*.

Scientific Name	Common Name
Agave sisalana (x)	Sisal (hemp)
Ananas Comosus (xx)	Pineapple (Cayenne and Queen)
Allium ascalonicum	Spring onion
Allium sativum	Garlic
Allium cepa	Onion
Aster chinensis	Aster
Beta cicla	Swiss Chard
Bixa orellana	Bixa
Brassica campestris	Turnip
Calendula officianalis	Calendula, Giant marigold
Callitris calcarata (xx)	Black Callitris
Callitris glauca (xx)	White Callitris
Carica papaya (x)	Papaya
Chloris gayana (xx)	Rhodes grass
Citrus spp. (xx)	Cairn rough lemon
Citrus spp. (xx)	Cape rough lemon
Citrus spp. (xx)	Cleopatra mandarin
Citrus spp. (xx)	Cleopatra x <i>Poncirus trifoliata</i>
Citrus spp. (xx)	Empress mandarin
Citrus spp. (xx)	Orlando tangelo
Citrus spp. (xx)	Rangpur lime
Citrus spp. (xx)	Troyer citrange
Dianthus caryophyllus	Carnation
Eragrostis curvula	Weeping love grass
Festuca elatior	Fescue
Helichrysum sp.	Everlasting
Hydrangea opuloides (x)	Hydrangea
Ipomoea batatas	Sweet potato
Litchi chinensis (xx)	Litchi, lychee
Macadamia intergrifolia (xx)	Macadamia
Panicum maximum	Sabi panic
Passiflora edulis (x)	Passion fruit, granadilla
P. edulis f. flavicarpa (x)	Yellow passion fruit, guavadilla
Phaseolus atropurpureus	Siratro
Pinus elliotii (xx)	Slash pine
Pinus patula (xx)	Patula pine
Pinus taeda (xx)	Loblolly pine
Poncirus trifoliata (xx)	Trifoliolate
Raphanus sativus	Radish
Raphanus sativus	Japanese radish, Daikon
Sanseveria spp.	Mother-in-law's tongue
Tagetes minuta	Mexican marigold, khakibos
Tagetes patula	French marigold
Tetragonia expansa	New Zealand spinach

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x Root samples taken at monthly intervals

xx Root samples taken at two-month intervals

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Table 2. Plants that are poor hosts of *Radopholus similis*.

Scientific Name	Common Name
Allium porrum	Leek
Beta vulgaris	Beetroot
Brassica oleracea	Cauliflower
Brassica oleracea	Cabbage

Table 2 (continued)

Cammelia sinensis (xx)	Tea
Canna indica (x)	Canna
Capsicum annum	Sweet pepper
Casuarina equisetifolia	Horsetail Casuarina
Citrullus vulgaris	Watermelon
Colocasia antiquorum (x)	Madumbe, Taro
Crotalaria juncea (x)	Sunn hemp
Croton glandulosum	Croton
Cucumis sativus	Cucumber
Cucurbita pepo	Pumpkin
Cupressus sp.	Mexican cypress
Cynara scolymus	Globe artichoke
Daucus carota	Carrot
Eragrostis tef	Teff
Eucalyptus camaldulensis	Red River Gum
Eucalyptus melliodora	Yellow Box
Fagopyrum esculentum	Buckwheat
Gossypium hirsutum	Cotton
Helianthus annuus	Sunflower
Lactuca sativa	Lettuce
Mangifera indica (xx)	Mango
Medicago sativa	Lucerne, Alfalfa
Nicotiana tabacum	Tobacco
Panicum antidotale	---
Persea americana (xx)	Avocado
Petroselinum crispum	Parsley
Phaseolus multiflorus	Runner bean
Phormium tena (x)	New Zealand flax
Saccharum officinarum (x) (xxx)	Sugarcane
Strelitzia nicolai	Natal wild banana
Triticum aestivum (xxx)	Wheat
Voandzeia subterranea	Jugo bean

x Root samples taken at monthly intervals

xx Root samples taken at two-month intervals

xxx Root injury moderate to severe

Table 3. Plants that are good hosts of *Radopholus similis*.

Scientific Name	Common Name
Ageratum conyzoides	Ageratum
Arachis hypogea	Groundnut
Coffea arabica (x)	Coffee
Cupressus (lindleyi) lusitanica (xx)	Mexican cypress
Cupressus macrocarpa (xx)	Monterey cypress
Glycine soja	Soyabean, Soybean
Lycopersicon esculentum	Tomato
Musa cavendishii (x)	Banana, Dwarf Cavendish
Musa paradisiaca (x)	Plantain
Solanum melongena	Aubergine, Brinjal
Solanum tuberosum (x)	Potato
Sorghum caffrorum	Grain sorghum
Zea mays	Maize
Zingiber officinale	Ginger

x Root samples taken at monthly intervals

xx Root samples taken at two-month intervals

Table 4. Effect of soil fumigation, weed-fallow and four plants on the population and development of *Radopholus similis*, *Helicotylenchus multicinctus* and *Meloidogyne* spp.

TREATMENT	Nematodes per 10 g of dry roots of bananas grown after the treatments.		
	<i>R. similis</i>	<i>H. multicinctus</i>	<i>Meloidogyne</i> spp.
Weed-fallow (barbecho) for 6 mos	204	3	0
<i>Sorghum caffrorum</i> (Sorghum)	248	128	41
<i>Arachis hypogea</i> (Groundnut)	44	24	0
<i>Raphanus sativus</i> (Radish)	3	23	0
<i>Allium cepa</i> (Onion)	69	90	0
<i>Tagetes patula</i> (Marigold)	0	1	0
EDB (2.25 = 21%) at 222 l/ha	0	0	0

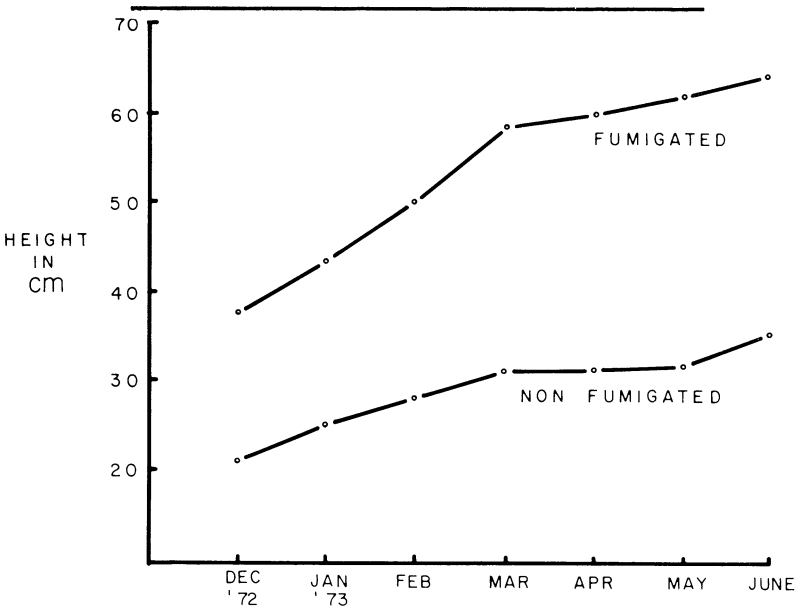


Figure 1. Growth of Coffee Seedlings.

plots using soil fumigated with EDB (2.25 = 21%) at the rate of 222 l/ha, weed fallow and five susceptible or resistant hosts (Tables 1 and 3). After a single season (approximately 4 mos), nematode-free banana plants were planted in each plot at a spacing of 1.8 m x 1.8 m. These bananas were then examined for nematodes, 6 mos after planting.

**C. Coffee seedling trial:** One-year-old coffee seedlings of the cultivar SL 34, were planted in soil fumigated with DBCP at 51 kg a.i./ha and *R. similis* infested soil. The growth of the seedlings was measured as height in cm, over a period of 7 mos, starting 3 mos after planting.

## RESULTS AND DISCUSSION

**A. Host plant trials:** Forty-four of the plants evaluated were not hosts of *R. similis* (Table 1.). Thirty-six were poor hosts (Table 2), and 14 were good hosts of *R. similis* (Table 3). It is interesting to note that the race of *R. similis* in Natal is apparently the "banana" race as none of the citrus cultivars tested were hosts. A reasonable number of economically usable plants were not hosts of the burrowing eelworm in this trial. Of the subtropical crops tested, those of value include pineapples, papaya, passion fruit, sweet potato and litchi.

**B. Rotation trial:** Soil fumigation, marigolds (*Tagetes patula*) and radishes (*Raphanus sativus*) were effective in reducing the populations of *R. similis* (Table 4). Marigolds also significantly reduced populations of *Helicotylenchus multicinctus* and *Meloidogyne* sp. The weed-fallow treatment resulted in no reduction in the population of *R. similis*.

**C. Coffee seedling trial:** The results of this trial are shown in Fig. 1. *R. similis* caused severe growth retardation of the coffee seedlings and soil fumigation with DBCP prior to planting the seedlings alleviated the symptoms.

The banana race of *Radopholus similis* is a potential pest of importance on many crops. There are, however, a number of crops which can be used to reduce the population, and such crops should be recommended in areas where soil fumigation or other nematicide treatment is regarded as too costly.

## RESUMEN

En un esfuerzo para encontrar cultivos alternos para suelos infestados con *Radopholus similis* se examinaron más de 100 especies de plantas para determinar la susceptibilidad a la raza bananera de esta nemátodo. Alrededor de unas 40 especies entre las cuales hubieron ciertas hortalizas, árboles frutales, gramíneas, y plantas ornamentales, resultaron ser inhospedables para el *Radopholus*. Entre los cultivos resistentes de valor económico hubieron: la pina, papaya, granadilla (*Passiflora edulis*), boniatos, litchi y rabanitos. También, *Tagetes edulis* redujo la población de *Radopholus*. Los cafetos probaron ser altamente susceptibles al ataque del *Radopholus*.

## REFERENCES

1. De Villiers, E. A., D. L. Milne & F. A. Kuhne. 1970. Farming in South Africa 423:1-3; 2. Keetch, D. P. 1972. Phytomythologica 4:51-58.