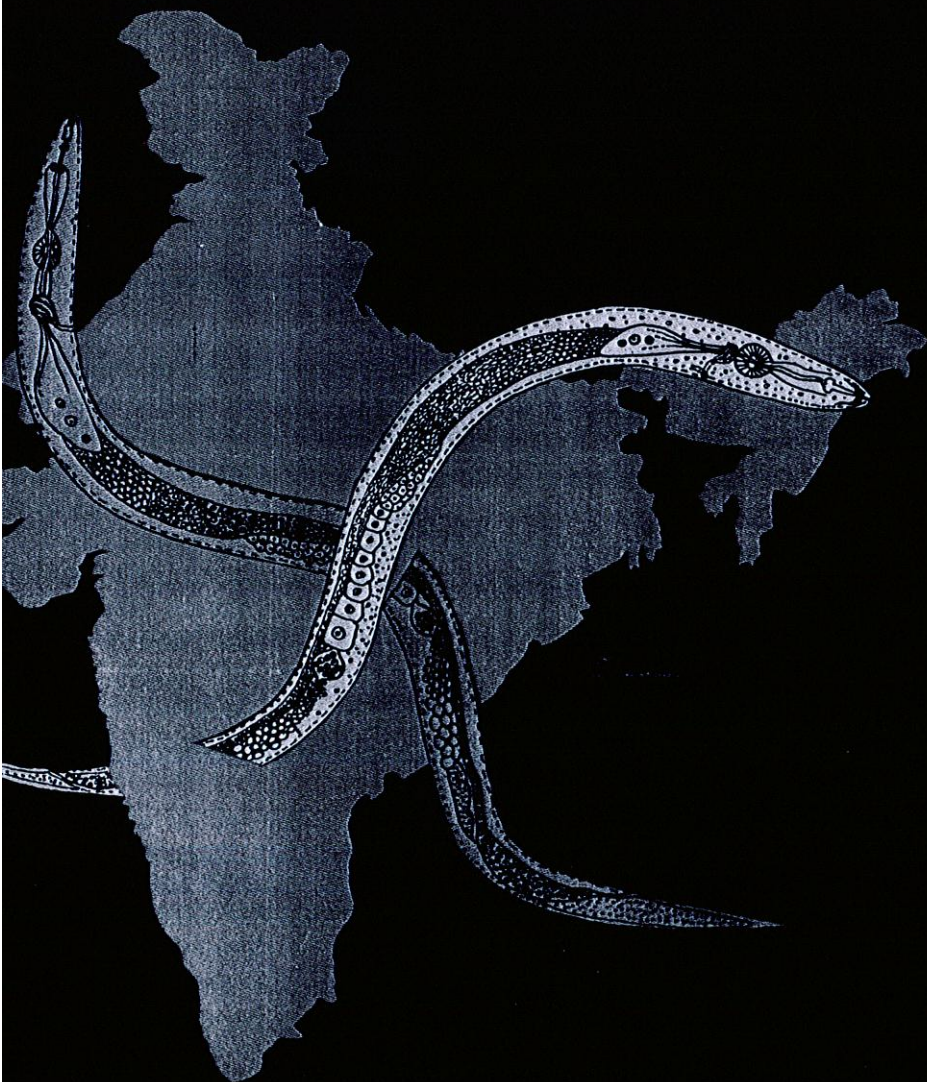


Phytoneematology in India



Nematology in Kerala - An Overview

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Kerala is geographically situated in the southern part of India, between 8°-18' latitude and 12°-48' latitude and between 74°-52' and 77°-22'; longitude with an area of 38,863 sq. km. The climate is of tropical and subtropical. On an average, Kerala receives about 3000 mm rainfall annually distributed throughout the year with the maximum rainfall during June/July.

Kerala with its wide range of topography, climate and soil allows the growth of varied natural vegetation and a great diversity of agricultural and horticultural crops. However, the major crops grown in Kerala are paddy, banana, rubber, coconut, tapioca, arecanut, tea, coffee and variety of spices like black pepper, cardamom, ginger, clove, nutmeg, cinnamon, etc. Agricultural holdings are mostly 'homestead gardens', which are marginal in area and with a variety of crops cultivated under mixed cropping system. High fertile humus rich soils, availability of soil moisture during the most part of the year, perennial nature of many plantation crops, mixed cropping systems etc. are highly congenial for multiplication of plant parasitic nematodes and so add further dimensions to nematode problems in Kerala.

Though the first reports on the occurrence of root knot nematodes on tea (Barber, 1901) and black pepper (Butler, 1906) were from Kerala, nematological investigations were initiated only during mid sixties. The first authentic report on the association of the burrowing nematode, *Radopholus similis* with banana in Kerala by Nair and others (1966) triggered the development of nematology in India and particularly in Kerala (Table 11.1). Research on nematological problems of plantation crops and spices was initiated during seventies with the establishment of nematology laboratories under Central Plantation Crops Research Institute, Regional Stations at Kayangulam and Calicut (now Indian Institute of Spices Research). A probe into the nematode problems of tuber crops was initiated recently at Central Tuber Crops Research Institute, Trivandrum.

Several systematic surveys were conducted in the past to identify plant parasitic nematodes infesting different crops in Kerala. Among several plant parasitic nematodes reported, a few species namely, *Meloidogyne* sp., *Radopholus similis*, *Helicotylenchus* sp., *Rotylenchulus reniformis*, *Hirschmanniella oryzae*, *Heterodera oryzicola* and *Pratylenchus* sp. are of economic importance (Table 11.2). *R. similis*, *M. incognita* and *H. oryzicola* attracted major attention of nematologists of Kerala since; these nematode species are polyphagous and caused severe crop losses (Table 11.3).

Table 11.1. Important milestones in the development of Nematology in Kerala

1901	First report on the occurrence of root knot nematode on tea by Barber
1906	First report on the occurrence of root knot nematode on black pepper by Butler
1965	Establishment of a nematology laboratory at College of Agriculture, Vellayani, Trivandrum
1966	First report on the occurrence of <i>Radopholus similis</i> in roots of banana by Nair et al.
1972	Establishment of a nematology laboratory at Central Plantation Crops Research Institute, Regional Station, Kayangulam
1975	Establishment of a nematology laboratory at College of Agriculture, Vellanikkara, Trichur
1979	Establishment of a nematology laboratory at Indian Institute of Spices Research (former regional station of Central Plantation Crops Research Institute and then National Research Centre for Spices)
1984	Establishment of a nematology laboratory at Central Plantation Crops Research Institute, Kasaragod
1987	Establishment of a nematology laboratory at Central Tuber Crops Research Institute, Kasaragod
1987	Establishment of a nematology laboratory at Central Tuber Crops Research Institute, Trivandrum

Table 11.2. Important plant parasitic nematodes associated with crops in Kerala

Crop	Nematode species
Arecanut	<i>Radopholus similis</i> , <i>Meloidogyne incognita</i> etc.
Banana	<i>M. incognita</i> , <i>R. similis</i> , <i>Heterodera oryzicola</i> , <i>Pratylenchus</i> sp., <i>Rotylenchulus reniformis</i> , <i>Helicotylenchus multicinctus</i> , etc.
Black pepper	<i>Meloidogyne incognita</i> , <i>Radopholus similis</i> , <i>Trophotylenchulus piperis</i>
Cardamom	<i>M. incognita</i> , <i>P. coffeae</i> , <i>R. reniformis</i> , etc.
Coconut	<i>R. similis</i>
Ginger and turmeric	<i>M. incognita</i> , <i>R. similis</i> , <i>Pratylenchus</i> sp., <i>R. reniformis</i> , etc.
Paddy	<i>Hirschmaniella oryzae</i> , <i>H. oryzicola</i> , etc.
Tuber crops (<i>Amorphophalus</i> , <i>Coleus</i> , Cassava, Sweet potato, yam, etc.)	<i>M. incognita</i> , <i>Pratylenchus</i> sp., <i>Hoplolaimus</i> sp., <i>R. reniformis</i> , etc.
Vegetables	<i>M. incognita</i>

A close look into the nematological investigations in Kerala reveals that these investigations were mainly concentrated on a few crops namely, coconut, arecanut, cardamom, black pepper, ginger, turmeric, banana and on major nematode species like *M. incognita*, *R. similis* and *H. oryzicola*. Research on nematode problems of other important crops of Kerala like rubber, tea, coffee, vegetables like brinjal, tomato, capsicum has to be initiated. Though, a few varieties were identified as resistant to root knot nematodes in black pepper, brinjal and okra, concerted efforts have to be made to find more sources of resistance to *R. similis* in black pepper, banana, coconut etc. and to *H. oryzicola* in banana.

A wide range of microorganisms suppressive to plant parasitic nematodes infesting coconut, black pepper, cardamom, ginger were identified. Among these biological control agents, vesicular arbuscular mycorrhiza (VAM) like *Glomus mossae*, *G. fasciculatum*, *G. etunicatum*, *Acaulospora laevis*, *Gigaspora margarita*; Hypomycetous fungi like *Paecilomyces lilacinus*, *Trichoderma* spp., *Gliocladium virens*, *Verticillium chlamydosporium* and the bacterium like *Pasteuria penetrans* are

promising. Exploitation of suppressive soils for the management of nematodes has not been attempted so far. Since Kerala is blessed with soils rich in organic matter, it is likely to harbour a variety of microorganisms suppressive to plant parasitic nematodes. The rapid progress made in the field of biotechnology can help in developing more efficient strains of biological control agents. More emphasis should also be given to the nursery management since planting materials for many plantation crops are generated in the nurseries. Different aspects like biology, pathogenic effects, population dynamics of important nematode species like *R. similis* and *M. incognita* and their management through chemicals, biocontrol agents, host resistance for developing integrated management in relation to the host have been worked out in detail.

Table 11.3. Yield losses due to plant parasitic nematodes in Kerala

<i>Nematode species</i>	<i>Crop</i>	<i>% yield loss</i>	<i>Reference</i>
<i>Meloidogyne incognita</i>	Black pepper	46	Mohandas and Ramana, 1991
	Cardamom	32-46	Eapen, 1994
	Ginger	5-74	Charles, 1978; Sudha and Sundararaju, 1986; AICRP, 1995
	Turmeric	5-35	Sudha et al., 1989; NRCS, 1993; AICRP, 1995
	Colocasia	24	CTCRI, 1990
	Brinjal	20-22	AICRP, 1995
<i>Radopholus similis</i>	Black pepper	59	Mohandas and Ramana, 1991
	Coconut	30	Koshy, 1994
	Ginger	39-73	Sundararaju et al., 1979; AICRP, 1995
	Turmeric	46-76	Sosamma et al., 1979
	Banana		
<i>Heterodera oryzaicola</i>	Paddy	31	AICRP, 1995

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