



Figure 1. Map of Neyyar Wildlife Sanctuary

excreta. These insects have great ecological significance, as the phytophagous insects are primary herbivores. The scavenger beetles are important in the conversion of dead organic matter and have important roles in nutrient cycling.

Among bugs, most species collected were phytophagous. Several species of hemipteran bugs belonging to the families Pyrrhocoridae, Scutellaridae, Cydnidae, Fulgoridae and Cicadidae were recorded.

The hymenopterans contained two species of honeybees, one species each of solitary bee and bumble bee and eight species of wasps. Although 21 dipteran fly species were collected none could be identified. In addition to these, several species of soil insects (termites and collembolans) had been collected and described from this region (Prabhoo, 1971).

Conclusion: Being a short-term study, only limited areas could be covered. Preliminary observations suggest Meenmutty in Neyyar as a biologically rich area. Both areas contain several rare and protected species of butterflies and moths. More intensive survey spread over different seasons would be required to provide a complete picture of the faunal diversity of this area.

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ASSOCIATION OF *MOLOIDOGYNE INCOGNITA* AND OTHER PLANT PARASITIC NEMATODES WITH DIFFERENT CROPS OF MANIPUR

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Plant parasitic nematode is an important pathogen which can reduce the yield of certain economically important crops. Many workers have been investigating the effect of root knot nematode *Meloidogyne incognita* and their association with other plant parasitic nematodes infecting many crops. Queneherve *et al.* (1995) investigated host status of some weeds to *Meloidogyne* spp., *Paratylenchus* spp., *Helicotylenchus* spp., *Rotylenchulus reniformis* associated with vegetables cultivated in polytunnels in Martinique for 33 weed species. Khan & Khan (1996) investigated occurrence of root knot nematode *M. incognita* and other plant parasitic nematode on vegetable crops in Uttar Pradesh. To investigate the effect and their number of association with other plant parasitic nematodes infecting many crops the study has been taken up for providing useful information in the nematode management programme.

Material and Methods: Altogether 81 soil samples from rhizospheric regions of different medicinal, wild and vegetable crops infected with *M. incognita* were collected. The samples were brought into the laboratory for extraction of nematode by Cobb's (1918) sieving and decanting method followed by modified Baermann's funnel technique. The extracted nematodes were killed, fixed and transferred into a desiccator at room temperature for about two to three weeks for complete dehydration. The dehydrated nematodes were mounted by using De Man's (1884) formula for denoting the dimension of the nematode and classification system followed by Siddiqi (1986) for *Tylenchus*. The number of genera counted in different samples were recorded according to the following notation.

Result and Discussion: During this investigation altogether 17 genera and 25 nematode species were found to be associated with juveniles of *M. incognita* (Table 1). Out of the plant parasitic nematode *Helicotylenchus* spp. were found to be most commonly found with the root knot nematode in different crops namely *Cyperus brevifolius*, *Biden biternata*, *Dactyloctenium aegypticum*, *Urena lobata*, *Curcuma longa*, *Atalantia malabarica*, *Sacharum officinarum*, *Fragaria indica* and *Punica granatum*. *Helicotylenchus* spp. is followed by *Basiria varians*, *Cephalenchus leptus*, *Imphalenchus indicus*, *Tylenchorhynchus elegans*, *Scutellonema* spp. *Xiphinema* spp., *Longidorus psidii*, *Ditylenchus caudatus*, *Pratylenchus caudatus*, *Hemicriconemoides mangifera*, *Tylenchorhynchus punensis*, *Psilenchus elegans*, *Aglenchus parvus*, *Coslenchus diversus*, *Boleodoros*

Table 1. Association of *M. incognita* and other plant parasitic nematodes with different crops of Manipur

SNo.	Nematodes sp.	Population level	Crops associated
1.	<i>Aglenchus parvus</i>	+	<i>Cynodon dactylon</i> , <i>Solanum melongena</i> , <i>Eupatorium birmanicum</i>
2.	<i>Coslenchus diversus</i>	+	<i>Psophocarpus tetragonolobus</i> , <i>Dolios lablab</i> and <i>Lycopersicon esculentum</i>
3.	<i>Coslenchus assamensis</i>	+	<i>Centella asiatica</i> , <i>Gynura cusimba</i> , <i>Allium cepa</i> , <i>Allium odorum</i> and <i>Hydrocotyle sibthorpiodes</i>
4.	<i>Boleodorus acutus</i>	++	<i>Capsicum annum</i> , <i>Mazus</i> sp., <i>Calocasia esculenta</i> , <i>Allium hookerii</i> and <i>C. asiatica</i>
5.	<i>Basiria varians</i>	++	<i>Hibiscus cannabinus</i> , <i>Vigna sinensis</i> , <i>Capsicum annum</i> and <i>Brassica oleracea</i>
6.	<i>Basiria graminophila</i>	+	<i>Psophocarpus tetragonolobus</i> <i>Roripa indica</i> and <i>Hibiscus cannabinus</i>
7.	<i>Neopsilenchus minor</i>	+	<i>Carica papaya</i> , <i>Lycopersicon esculentum</i> , <i>Abelemoschus esculentus</i> and <i>Brassica napus</i> .
8.	<i>Neopsilenchus affinis</i>	+	<i>Curcuma longa</i> , <i>Houttuynia cordata</i> , <i>Vigna sinensis</i> and <i>Viola pilosa</i> .
9.	<i>Cephalenchus leptus</i>	++	<i>Sonchus asper</i> , <i>Ageratum conyzoids</i> , <i>Alocasia indica</i> and <i>Meriandra bengalensis</i>
10.	<i>Molenchus acarayensis</i>	+	<i>Capsella bursa</i> , <i>Eryngium foetidum</i> , <i>Cyperus haspan</i> , <i>Hydrocotyl sibthorpiodes</i> and <i>Lycopersicon esculentum</i>
11.	<i>Imphalenchus indicus</i>	++	<i>Sonchus asper</i> , <i>Allium sativum</i> , <i>Dicrophala intigrifolia</i> and <i>Toona ciliata</i>
12.	<i>Tylenchorhynchus eligans</i>	++	<i>Eclipta prostrata</i> , <i>Psidium guajava</i> , <i>Oxalis corniculata</i> , <i>Mazus</i> sp., <i>Glycine max</i> and <i>Calocasia gigantea</i>
13.	<i>Tylenchorhynchus punensis</i>	+	<i>Viola pilosa</i> , <i>Brassica napus</i> , <i>Vicia faba</i> and <i>Pisum sativum</i>
14.	<i>Psilenchus elegans</i>	+	<i>Sesamum sesban</i> , <i>Calocasia gigantea</i> , <i>Benincosa hispida</i> and <i>Vigna mungo</i>
15.	<i>Scutellonema africanum</i>	++	<i>Pisum sativum</i> , <i>Solanum melongena</i> , <i>Zingiber officinale</i>
16.	<i>Scutellonema sheri</i>	++	<i>Cyathula tometosa</i> , <i>Poligonum plebizum</i> , <i>Eclipta alba</i> and <i>Cynodon dactylon</i>
17.	<i>Helicotylenchus dihystra</i>	+++	<i>Cyperus brevifolius</i> , <i>Biden biternata</i> , <i>Dactyloctenium aegypticum</i>
18.	<i>Helicotylenchus bihari</i>	+++	<i>Urena lobata</i> , <i>Curcuma longa</i> and <i>Atalantica malabarica</i>
19.	<i>Helicotylenchus erithrinae</i>	+++	<i>Saccharum officinarum</i> , <i>Fragaria indica</i> and <i>Punica granatum</i>
20.	<i>Hemicriconemoides mangifera</i>	+	<i>Meriandra bengalensis</i> , <i>Ananas comosus</i> and <i>Sonchus asper</i> .
21.	<i>Ditylenchus caudatus</i>	++	<i>Portulaca oleracea</i> , <i>Ocimum canum</i> , <i>Hibiscus cannabinus</i> and <i>Plantago erosa</i>
22.	<i>Pratylenchus caudatus</i>	+	<i>Portulaca oleracea</i> , <i>Ocimum canum</i> , <i>Hibiscus cannabinus</i> and <i>Plantago erosa</i>
23.	<i>Longidorus psidii</i>	+	<i>Cannavalia ensiformis</i> , <i>Cucurbita mexicana</i> and <i>Allium cepa</i>
24.	<i>Xiphinema insigni</i>	+	<i>Musa paradisiacal</i> , <i>Persicaria posumbu</i> , <i>Glycine max</i> , <i>Oryza sativa</i> and <i>Vicia faba</i>
25.	<i>Xiphinema americanum</i>	+	<i>Ipomoea aquatica</i> , <i>Cicer arictilum</i> , <i>Abelemoschus esculentus</i> and <i>Viola pilosa</i>

+ = 1 to 50 number of particular nematode per 500gm of soil; ++ = 51 to 100 number of particular nematode present per 500gm of soil; +++ = More than 100 number of particular nematode present per 500gm of soil.

acutus, *Basiria graminophila*, *Neopsilenchus* sp. and *Molenchus acarayensis* although in varying degrees and numbers. The result supports the view of Reddy & Singh (1979) who worked out *Tylenchulus* sp., *Pratylenchus* sp., *Hoplolaimus* sp. and *Meloidogyne* sp. as important encountered genera along with other parasitic nematode infecting citrus root. Rautaray *et al.* (1987) worked out association of plant parasitic nematode and *M. incognita* infested ginger and turmeric in Orissa. *M. incognita* was commonly encountered nematode next to *Macroposthonia ornato* infecting ginger. Like the present findings, Ali (1989) also reported 15 genera of plant parasitic nematode in association with *Meloidogyne* sp. Among the 15 genera *Helicotylenchus* sp. were found as the most dominated genera. The results are in adjustable conformity with the works of Devrajan (2001) who reported the association of plant parasitic nematode with *Meloidogyne* sp. in the cultivated crops of Tamirabarani river basin in Tamil Nadu. Among the nematodes observed *Helicotylenchus multicinctus*, *Pratylenchus coffeae*, *Radopholus similes*, *M. incognita* and *Hoplolaimus* sp. occurred more frequently.

From the above investigation it can be concluded that by knowing the degree of infestation in association with the plant parasitic nematodes and root knot nematode species. The study will be helpful in nematode controlling practices.

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