

OCCURRENCE AND DISTRIBUTION OF PLANT PARASITIC NEMATODES IN WEST BENGAL¹

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Occurrence and distribution of 74 nematode species within 32 genera in West Bengal, has been reported as a result of a survey undertaken in four of ten agroecological regions of the State. Several species of each of *Helicotylenchus*, *Hoplolaimus*, *Tylenchorhynchus*, *Pratylenchus*, *Hirschmanniella*, *meloidogyne*, *Tylenchulus Parafongidorus* as well as *Rotylenchulus reniformis* are considered the most widespread and polyphagous. Many of these are considered to be associations new to science. This study along with the previous reports may now form the basis of a nematode advisory programme in this State in which nematode problem is not yet realised in its proper perspective.

Nematode problem is generally not realised in its proper perspective in this State. In west Bengal, some nematode surveys has been done and informations on occurrence have been scanty. Hence a thorough survey on soil and plant parasitic nematodes of West Bengal have been conducted. Some findings have been previously reported (Mukherjee and Dasgupta, 1979, 1980, 1981 *a, b, c*, 1982; Mukherjee *et al.*, 1981 *a, b*; Siddiqi *et al.*, 1982). But this is a comprehensive report of the present survey.

MATERIAL AND METHODS

Three hundred and ten soil and 120 root samples were collected during 1978-81 from 35 economically important crops from different localities representing four of ten agroecological regions covering about 70% of the land area of West Bengal. Sites of

sampling were chosen both on the basis of unattributable crop failures and slow yield declines, unthrifty growth etc, and as random samples from the regions covered. At each location composite soil and root samples consisting of 10-30 subsamples were taken and an aliquot of 250 ml soil samples were processed, and nematodes were extracted by wet sieving (60-350 mm mesh) and modified Baermann funnel technique (Christie and Perry, 1951) or the suspension was further cleared by overnight extraction over double-layered tissue paper. Root mass was segmented, washed, blended and sieve over 60 and 350 mm mesh and residue extracted for 24 hr. Root samples of 20 g size were comminuted and incubated dilute H₂O₂ (Gowen and Edmunds, 1973) or incubated in Young's method (1954), cleared, stained and examined.

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Ectoparasitic fauna were recovered, heat-relaxed, killed in water at 60°C for 2 min and fixed either in TAF of FAA or 4% formalin. Ten per cent aliquots of each suspension were taken, counted, dehydrated (Seinhorst, 1959) and permanently mounted. *Meloidogyne* spp. were identified by reference to Taylor *et al.*, (1955). Others were identified up to genus and specific identities were confirmed by Siddiqi and Jairajpuri (CIP, London), E. Khan (IARI, New Delhi) and Bagri (ZSI, Calcutta).

RESULTS AND DISCUSSION

Seventy-four species of plant parasitic nematodes within 32 genera were recorded during the survey raising the number of plant-nemic species recorded from this State to 87 within 35 genera. Distribution of these nematode species, their association with plant species and intensity of population have been presented in Table 1

The commonly occurring genera and their intensity of association with different crops are discussed below in the order of their prevalence.

Helicotylenchus - Eight species were commonly prevalent in fruit orchards with high population counts in banana and citrus. *H. abunamai* and *H. dihystra* may be deeply associated with citrus decline and tea decline respectively.

Hoplolaimus - Three species were widely distributed and associated with diverse crops being even semi-endo-

parasitic on some. *H. indicus* population was high in banana (1270/250 ml soil), rice seeded (1050/250 ml soil) and tobacco (985/250 ml soil). *H. seinhorsti* population was second to the former. *H. Columbus* was recorded from okra, cauliflower, *Colocassia*, tobacco and *Shorea robusta*. *Tylenchorhynchus*—Nine species including one new species and a subspecies were recorded. *T. brassicae*, *T. coffeae*, *T. crassicaudatus leviterminalis* n. subsp., *T. nudus* and *T. trilineatus* were recorded on fruit trees, *T. elegans* on vegetables and *T. annulatus* and *T. mashoodi* populations were high in sugarcane being 750 and 520 per 250 ml soil respectively.

Pratylenchus—*P. coffeae*, *P. brachyurus*, *P. zaeae* were prevalent on fruit trees. *P. loosi* population was very high on tea indicating its involvement with tea decline. *P. brachyurus* population was also moderate to high.

Rotylenchulus reniformis was widely distributed among fruits, vegetables and fields crops in low to moderate numbers. This is the most common, most polyphagous and widespread nematode in the State, which attacks 15 crops. *Meloidogyne* - Larvae were detected from citrus, guava, litchi, mandarin orange, pineapple, banana and sugarcane. *M. brevicauda* population was moderate to high on tea. *Hirschmanniella* - *H. mucroniata* and *H. oryzae* were recorded on rice, wheat, mungbean and tobacco.

Hemicriconemoides - *H. cocophilus* and *H. mangiferae* were recorded with fruit trees, rice and tea.

Macroposthonia-Four species were obtained on mandarin orange and various other crops. High population of *M. onoensis* was recorded on Mandarin in orange whereas tea harboured high population of *M. ornata*.

Caloosia purtona - High population of 820/250 ml was observed on rice but banana and citrus supported low populations.

Tylenchulus semipenetrans was noted in moderate to high numbers on *Citrus* spp. including Mandarin orange as well as *Eugenia formosa*.

Among the member of the family *Longidoridae*, *Longidorus* sp. *Paralongidorus citri*, *Sidpiqia citri*, *Xiphinema americanum* X. *insigne* X *elongatum* and *Xiphinema* spp. were very common. *Longidorus* sp. was associated with vegetable. *X. insigne*, *P. citri* and *S. citri* were associated with citrus trees and extremely high population of *X. insigne* in the citrus orchard showing marked decline indicated a major pathogenic role played by this nema.

The present information along with the previous reports may form the basis of future nematode advisory programmes in the State since now the most important nematode species and the crops they affect and the areas in which they occur have been identified for about 70 p.c. of the land area of West Bengal.

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Table 1 Distribution and population of plant parasitic nematodes associated with different crops in West Bengal, India (1978-81).

Nematods species	Associated crops
<i>Aglencous agricola</i> (de Man, 1884)	Cherry, Mandarin orange, Plum, Tea.
<i>Amplimerlinius</i> n. sp.	Pear, Plum.
<i>Aphelenchus avenea</i> Bastian, 1865.	Chilli, Cabbag, <i>Citrus limettoides</i> , Custard apple Jack fruit, Jute, Litchi, Mandarin orange, Mango, <i>Musa paradisiaca</i> , <i>M. sapientum</i> , Pineapple, Sorghum, Tea Tobacco.
<i>Aphelenchus bicaudatus</i> (Imamura, 1931).	Mandarin orange, Plum.
<i>Aphelenchoides</i> sp.	Cotton, Pineapple, Tea.
<i>Atalantadorus porosus</i> (Allen, 1957).	Almond, Apple, Cherry, Pear, Plum, Tea.
<i>Basiria graminophila</i> Siddiqi, 1959.	Mandarin orange, Mango, Litchi,
<i>Boleodorus</i> sp.	<i>M. baradisiaca</i> , Mango.
<i>Caloosia parlona</i> Khan et al., 1979.	<i>C. aurantifolia</i> , <i>C. limettoides</i> , <i>C. reticulata</i> Cotton, Rice <i>M paradisiaca</i> .
<i>Cephalenchus leptas</i> (Siddiqi, 1963) Goden, 1971	<i>M paradisiaca</i> <i>M. sapientum</i>
<i>Coslenchus costatus</i> (de Man, 1921.	Apple, Litchi, Mango, Pear, Tea.
<i>Ditylenchus</i> sp.	Cotton, Pineapple.
<i>Filenchus</i> sp.	Apple, Cherry, Plum.
<i>Helicotylenchus adunaamai</i> Siddiqi 1972.	<i>C. aurantifolia</i> , <i>C. limettoides</i> , <i>C. reticulata</i> ; Cotton Jute, Rice, <i>M. paradisiaca</i> , Sugarcane.
<i>H. dihystra</i> (Cobb, 1893).	Almond, Litchi, Mandrin orange Plum, Pineapple.
<i>H. erythrinae</i> (Zimmerman, 1904). Colden, 1956.	Tea.
<i>H indicus</i> Siddiqi, 1966.	Guava, <i>M. paradisiaca</i> <i>M. sapientum</i> , Tobacco.
<i>H. microcephalus</i> Sher, 1966.	Mango.
<i>H. mucronatus</i> Siddiqi, 1963.	Pear.

Nematods species	Associated crops
<i>H. multincinctus</i> (Cobb, 1893)	<i>M. paradisiaca</i> , <i>M. Cavendishii</i>
<i>Helicotylenchus</i> sp.	Okra, Califlower Custard apple <i>M. paradisiaca</i> Sugar- cane, Tea.
<i>Hemicriconemoides cocophilus</i> (Loos, 1949)	<i>C. aurantifolia</i> <i>C. limettoides</i> <i>C. reticulata</i> Mango Rice Tea.
<i>H. mangiferae</i> Siddiqi 1961.	Custard apple Jackfruit <i>Eugenia formosa</i> Litchi, Mango <i>M. paradisiaca</i> <i>M. cavendishii</i> , Tea.
<i>Hirschmannilla mucronata</i> (Das, 1960)	Rice, Wheat.
<i>H. oryzae</i> (Saltwedel, 1899)	Mungbean Rice Tobacco.
<i>Hoplolaimus columbus</i> Sher, 1963	Okra, Cauliflower <i>Colocassia antiquorum</i> Custard apple Jackfruit Tobacco <i>M. paradisiaca</i> <i>M. sapientum</i> .
<i>H. indicus</i> Sher, 1963	Custard apple Guava Litchi Mango <i>M. paradisiaca</i> <i>M.</i> <i>sapientum</i> <i>M. Cavendishii</i> Pineapple Sugarcane Tobacco
<i>H. seinhorsti</i> Luc, 1958.	Australian Acacia Cauliflower <i>C. aurantifolia</i> <i>C. limet-</i> <i>toides</i> <i>C. reticulata</i> Cotton Guava <i>M. paradisiaca</i> Jute Rice <i>Shorea robusta</i> .
<i>Longidorus</i> sp.	Okra Cauliflower <i>C. antiquorum</i> .
<i>Macroposthonia cufeum</i> Khan <i>et al.</i> , 1975	<i>C. reticulata</i> Sugarcane.
<i>M. ornata</i> Raski, (1958).	Guava, Pineapple, Sugarcane, Tobacco, Tea.
<i>M. onoenis</i> (Luc, 1959).	Cotton, Jute, Litchi Mandarin orange, Pineapple, Tea.
<i>Macroposthonia</i> sp.	Apple, <i>C. limettoides</i> , Custard apple, Jackfruit, Mung- bean Pineapple.
<i>Meiodogyne brevicauda</i>	Tea.
<i>M. incognita</i> (Kofoid & White, 1919)	Okra, Chilli Cabbage, Califlower, Mungbean, <i>M. para-</i> <i>disiaca</i> .
<i>Meloidogyne</i> spp (Juveniles)	<i>C. limettoides</i> Guava, Litchi, Mandarin orange, Mango, Pineapple <i>M. paradisiaca</i> Sugarcane, Tobacco.
<i>Orientylus</i> n. sp.	Guava
<i>Paralongidorus citri</i>	<i>C. aurantifolia</i> <i>C. limettoides</i>
<i>Paralongidorus</i> sp.	Cabbage, Songhum.
<i>Pratylenchus dianthus</i>	Tea.
<i>Pratylenchus brachyurus</i> (God- frey, 1929).	Guava, <i>M. paradisiaca</i> <i>M. Cavendish</i>
<i>P. coffeae</i> (Zimmerman, 1893.	Almond, Cotton Custard apple, Jackfruit, Jute, Litchi, <i>M. paradisiaca</i> , <i>M. sapientum</i> , <i>M. cavendishi</i> , Pear, Plum, Tobacco.
<i>P. loosi</i> Loof, 1960.	Pineapple, Tea
<i>P. zaeae</i> Graham, 1951.	<i>C. aurantifolia</i> , Mango, Pineapple, Sugarcane.

Nematode species	Associated crops
<i>Pratylenchus</i> sp.	Apple, Charry.
<i>Quinisulcis oopitatus</i> (Allen, 1955).	Mandarin orange.
<i>Rotylenchus reniformis</i> Linford & Oliveira, 1940	Australian Acacia, Okra, Cauliflower <i>C. aurantifolia</i> <i>C. limettoides</i> , Cotton, <i>Eugenia forsmosa</i> Jackfruit, Litchi Mango <i>M. paradisiaca</i> <i>M. sapientum</i> , <i>M. cavendishi</i> Mungbean Tobacco.
<i>Sakia indica</i> Husain & Khan 1965.	Cherry, Cotton, Litchi Mandarin orange, Mango, <i>M. paradisiaca</i> .
<i>Scutellonema brachyurum</i> (Speiner, 1938).	Mandarin orange.
<i>S. siamense</i> Timm, 1965.	<i>M. paradisiaca</i> <i>M. sapientum</i> .
<i>Siddiqia citri</i> (Siddiqi, 1959)	Okra <i>C. aurantifolia</i> <i>C. limettoides</i> Cauliflower <i>C. antiquorum</i> Sugarcane Tobacco. Mungbean.
<i>Siddiqia</i> sp	Australian Acacia Cherry.
<i>Tylenchorhynchus annulatus</i> (Cassidy, 1930)	Sugarcane.
<i>T. brassicae</i> Siddiqi, 1961.	Litchi.
<i>T. coffeae</i> Siddiqi, & Basir 1959.	Australian Acacia Custard apple Litchi, <i>M. paradisiaca</i> , <i>M. sapientum</i> <i>M. Cavendishi</i> .
<i>T. crassicaudatus</i> Williams. 1960	Jackfruit Mango <i>M. paradisiaca</i> <i>M. sapientum</i> <i>M. Cavendishi</i> .
<i>T. c. levitarminalis</i> n subsp. Siddiqi, et al 1982.	<i>M. paradisiaca</i> Mango Jackfruit.
<i>T. elegans</i> Siddiqi 1961	Chilli, Cabbage, Guava, Sorghum, Sugarcane, Wheat, Sugarcane.
<i>T. Mashoodi</i> Siddiqi & Basir, 1959	Australian Acacia, Chilli, <i>M. paradisiaca</i> .
<i>T. nudus</i> Allen, 1955	<i>E formosa</i>
<i>T. trijineatus</i> Timm, 1963	Australian Acacia, Tobacco
<i>T. microconus</i> n. sp Siddiqi, et al 1982	Tea
<i>Tylenchus arcuatus</i> Siddiqi, 1963	Almond, Guava, Mango, Wheat
<i>Tylenchus</i> sp	<i>C. aurantifolia</i> , <i>C. limettoides</i> <i>E. formosa</i> , Mandarin
<i>Tylenchulus semipenetrans</i>	Custard apple, <i>E formosa</i>
<i>Xiphinema americanum</i> Cob, 1913	Sal, Sugarcane
<i>X. basiri</i> Siddiqi, 1959	Apple, Pear Plum
<i>X. brovicolle</i> Lordello & De Costa, 1961	Pineapple, Mandarin orange
<i>X. elongatum</i> S. Stekhoren & Teunn, 1938	Sal
<i>X. index</i> Thorne & Allen, 1950	Custard apple, <i>E formosa</i> , <i>C. limettoides</i> , <i>C. reticulata</i> <i>C. aurantifolia</i> Litchi <i>M. paradisiaca</i> , <i>M. sapientum</i> .
<i>X. insigne</i> Loss, 1949	Almond, Cherry, Pear
<i>X. radicolica</i> Goodey, 1936	Mandarin orange Rice.
<i>Xiphinema</i> sp.	