

# **NEMATODES FROM WEST BENGAL (INDIA). XXV. QUALITATIVE AND QUANTITATIVE STUDIES OF PLANT AND SOIL INHABITING NEMATODES ASSOCIATED WITH PADDY CROP IN MALDA AND JALPAIGURI DISTRICTS**

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## **INTRODUCTION**

Baqri and his co-workers (1980-91) have published a series of papers on plant and soil nematodes collected during the surveys of paddy crop in different districts of West Bengal. These papers also report, besides taxonomical work, the results of qualitative and quantitative studies identifying the potential/serious nematode pests of paddy crop in the districts of the state (Baqri *et. al.* 1983, 1991a, 1991b). Such information becomes more useful in chalking out any strategy on the management of phytophagous nematodes.

The present paper reports the results of qualitative and quantitative estimation of plant and soil nematodes associated with paddy crop in Malda and Jalpaiguri districts of West Bengal. These studies were conducted under the All India Coordinated Research Project on Nematode Pests (sponsored by ICAR, New Delhi) during the years 1978-85. The data on the information furnished herewith is the unpublished part of the final report of the Coordinated project submitted to the ICAR, New Delhi.

## **MATERIAL AND METHODS**

The sampling was made at random. For the quantitative estimation, the methodology described by Baqri *et al.* (1983) was followed. The nematode population per 200 ml (beaker) soil was counted from each sample under stereoscopic binocular microscope. From each root sample, 10 gm roots were processed through blender and phytophagous nematode population (genera wise) was also estimated.

## **RESULTS AND DISCUSSIONS**

### **A. QUALITATIVE STUDY**

#### **I. District Malda**

During November, 1983, 40 soil and root samples were collected from nine localities of district Malda. In all, 13 species of the established/suspected phytophagous nematodes of Order

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Tylenchida have been identified from the district. Besides, 21 species of saprophagous and predaceous groups have also been identified under the Orders Aphelenchida and Dorylaimida.

Order TYLENCHIDA Thorne, 1949

1. *Filenchus* sp.
2. *Tylenchorhynchus mashhoodi* Siddiqi & Basir, 1959
3. *T. devittatus* Siddiqi, 1961
4. *Hoplolaimus indicus* Sher, 1963
5. *Helicotylenchus minzi* Sher, 1966
6. *H. retusus* Siddiqi & Brown, 1964
7. *Pratylenchus pratensis* (de Man, 1880) Filipjev, 1936
8. *P. scribneri* Steiner, 1943
9. *P. thornei* Sher & Allen, 1953
10. *Hirschmanniella gracilis* (de Man, 1880) Luc & Goodey, 1964
11. *Meloidogyne graminicola* Golden & Birchfield, 1965
12. *Macroposthonia ornata* (Raski, 1958) de Grisse & loof, 1965
13. *Hexatylus* sp.

Order APHELENCHIDA Siddiqi, 1980

1. *Aphelenchus avenae* Bastian, 1865

Order DORYLAIMIDA de Man, 1976

1. *Dorylaimus stagnalis* Dujardin, 1845
2. *Laimydorus siddiqii* Baqri & Jana, 1982
3. *Calodorylaimus simplex* Baqri & Jana, 1982
4. *Thornenema mauritianum* (Williams, 1959) Baqri & Jairajpuri, 1967
5. *T. pseudosartum* Carbonell & Coomans, 1987
6. *Aporcelaimellus heynsi* Baqri & Jairajpuri, 1968
7. *Lenonchium oryzae* Siddiqi, 1965
8. *Miranema gracile* Thorne, 1939
9. *Proleptonchus clarus* Timm, 1964
10. *Dorylaimoides arcuicaudatus* Baqri & Jairajpuri, 1969
11. *D. constrictoides* Goseco, Ferris & Ferris, 1976
12. *D. leptura* Siddiqi, 1965
13. *D. micoletzkyi* (de Man, 1921) Thorne & Swanger, 1936
14. *D. paulbuchneri* Meyl, 1956
15. *Tylencholaimus pakistanensis* Timm, 1964

16. *Basirotyleptus basiri* Jairajpuri, 1964
17. *Dorylaimellus deviatus* Baqri & Jairajpuri, 1968
18. *D. indicus* Siddiqi, 1964
19. *D. projectus* Heyns, 1962
20. *Paraoxydirus gigas* (Jairajpuri, 1964) Jairajpuri & Ahmad, 1979

## II. District Jalpaiguri

During the survey of district Jalpaiguri, 42 soil samples were collected from ten localities. These samples have yielded 13 phytophagous nematode species belonging to the orders Tylenchida. Besides, 18 species of saprophagous and predaceous nematodes under the orders Aphelenchida, Dorylaimida and Mononchida have also been recorded.

### Order TYLENCHIDA Thorne, 1949

1. *Tylenchorhynchus mashhoodi* Siddiqi & Basir, 1959
2. *Hoplolaimus indicus* Sher, 1963
3. *Helicotylenchus dihystra* (Cobb, 1893) Sher, 1961
4. *H. abunaamai* Siddiqi, 1972
5. *H. digitatus* Siddiqi & Husain, 1964
6. *H. microcephalus* Sher, 1966
7. *Pratylenchus scribneri* Steiner, 1943
8. *Hirschmanniella gracilis* (de Man, 1880) Luc & Goodey, 1964
9. *H. oryzae* (van Breda de Haan, 1902) Luc & Goodey, 1964
10. *Meloidogyne graminicola* Golden & Birschfield, 1965
11. *Hemicriconemoides cocophillus* (Loos, 1949) Chitwood & Birschfield, 1957
12. *Macroposthonia ornata* (Raski, 1958) de Grosse & Loof, 1965
13. *Gracilacus janai* Baqri, 1979

### Order APHELENCHUS Siddiqi, 1980

1. *Aphelenchus avenae* Bastian, 1865

### Order DORYLAIMIDA Pearse, 1942

1. *Laimydorus siddiqii* Baqri & Jana, 1982
2. *Calodorylaimus* sp.
3. *Thornenema mauritianum* (Williams, 1959) Baqri & Jairajpuri, 1967
4. *Sicagutuur coomansi* (Baqri & Jana, 1980) Carbonell & Coomans, 1986
5. *Aporcelaimellus heynsi* Baqri & Jairajpuri, 1968

6. *Belondria neortha* Siddiqi, 1964
7. *Dorylaimellus indicus* Siddiqi, 1964
8. *Axonchium amplicolle* Cobb, 1920
9. *Neoactinolaimus* sp.
10. *Proleptonchus clarus* Timm, 1964
11. *Doryaimoides indicus* Jairajpuri, 1965
12. *Basirotyleptus basiri* Jairajpuri, 1964
13. *Tylencholaimus pakistanensis* Timm, 1964
14. *Tyleptus projectus* Thorne, 1939
15. *Discomyctus cephalatus* Thorne, 1939
16. *Laievides paraaquaticus* (Paetzold, 1958) Ahmad & Jairajpuri, 1982

#### Order MONONCHIDA Jairajpuri, 1969

1. *Mononchus aquaticus* Coetae, 1968

## B. QUANTITATIVE STUDY

### I. District Malda

The results of the quantitative estimation of important parasitic genera and other nematodes (saprophagous and predaceous) from the surveyed localities of Malda district have been furnished in Table-I and III. Table-I provides information about the surveyed localities, number of samples collected, range with average and percent of frequency of occurrence and dominance of important nematode genera estimated in the soil of paddy fields. The information about frequency of occurrence and degree dominance (average) of key nematode pests from soil and roots of paddy crop has been furnished in Table-III.

Upon analysis (Table-III), it was noted that *Hirschmanniella gracilis*, *Meloidogyne graminicola* (larvae) and *Tylenchorhynchus mashhoodi* were most abundant species because their frequency of occurrence was observed in 97.5%, 80% and 72.5% in soil samples respectively. *Hirschmanniella gracilis* was found dominating in 77.5% samples while the dominance of *Tylenchorhynchus mashhoodi* and *Meloidogyne graminicola* has been noted in 15% and 7.5% soil respectively. The results of the quantitative estimation of nematodes from roots /10 gm reveal that the number of *Meloidogyne graminicola* (2nd stage juveniles) ranges from 2-664 with an average of 119, which is considered to be very high. The frequency of occurrence of this species has been noted in 70% root samples. The range of *Hirschmanniella gracilis* (adults and juveniles) was counted from 4-82 with an average of 18 in 97.5% root samples. On the basis of all these results, this can easily be concluded that *M. graminicola* and *H. gracilis* are serious pests. Besides, *Tylenchorhynchus mashhoodi* is a potential pest in district Malda.

### II. District Jalpaiguri

The results of quantitative estimation of nematodes from 42 soil and root samples collected

from 10 villages near Jalpaiguri have been furnished in Table-II. The information on average of soil and root populations has been incorporated in Table-III. The analysis in Table-II reveals that *Hirschmanniella* spp. (mostly *H. gracilis*), *Meloidogyne graminicola* and *Tylenchorhynchus mashhoodi* are also abundant in Jalpaiguri district. *Hirschmanniella* spp. were noted in 90.5% and found dominating in 73% soil samples over other parasitic nematodes (Table-III). The occurrence of *Meloidogyne graminicola* and *Tylenchorhynchus mashhoodi* was noted in 66% and 26% samples whereas they dominated in 20% and 7% samples respectively. The occurrence of *Helicotylenchus* spp. (*H. retusus* & *H. dihystra*) and *Pratylenchus thornei* and other parasitic nematodes was not significant. The results of estimation of nematode populations/10gm roots conclude that the 2nd stage juveniles of *Meloidogyne graminicola* are abundant and found in high number, i.e. from 2-128 with an average of 97 and frequency of occurrence 66.3%. The *Hirschmanniella* spp. (mainly *H. gracillis*) were estimated from 01-40 with an average of 06 and frequency of occurrence 90.5%.

All these results confirm that *M. graminicola* and *Hirschmanniella* spp. are the key pests of paddy crop in Jalpaiguri district.

### SUMMARY

The present paper reports the results of qualitative and quantitative studies of plant and soil nematodes associated with paddy crop in Malda and Jalpaiguri districts of West Bengal. In Malda district, 34 species were identified, of which 13 belong to phytophagous group of the Order Tylenchida. The remaining 21 species were either predaceous or saprophagous belonging to the orders Aphelenchida and Dorylaimida. The frequency of occurrence of *Hirschmanniella gracilis* was observed in 97.5% but dominated in 77.5% samples. *Meloidogyne graminicola* and *Tylenchorhynchus mashhoodi* were the other two important nematode pests in district Malda. Though they were encountered in 80% and 72.5% soil samples, but were found dominant only in 15% and 7.5% samples, respectively. The estimation of nematodes/10gm roots of paddy from the same fields also confirm the above results.

In all, 31 species of the orders Tylenchida, Aphelenchida, Dorylaimida and Mononchida have been identified from Jalpaiguri district. Of these, 13 species of the order Tylenchida are phytophagous and the remaining are either saprophagous or predaceous. The quantitative estimation of the phytophagous nematodes from soil and root samples reveal that *Hirschmanniella* spp. mainly *H. gracilis*, *Meloidogyne graminicola* and *Tylenchorhynchus mashhoodi* are the most important pests of rice crop in Jalpaiguri district because their frequency of occurrence has been calculated in 90.5%, 66% and 26% soil samples, respectively. *Hirschmanniella* spp. and *M. graminicola* (both endoparasites) have also been recorded from 90.5% and 66% root samples. Hence, our study reveals that these species are the key pests of paddy crop in Jalpaiguri district.

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TABLE - I

Results of the survey of Paddy crop in Malda district, West Bengal.  
Range of nematode number with its average per 200 ml of soil.  
Figures in parenthesis indicate percent frequency of occurrence.

	LOCALITY / VILLAGE				
	Jalanga	Maligram	Sugandighi	Kanchantar	Jadhupur
No. of samples collected	6	6	6	3	4
Nematode associated					
1. <i>Meloidogyne</i>	10-460 : 140 (100)	30-380 : 110 (83.3)	10-80 : 44 (83.3)	10-40 : 25 (100)	10-20 : 15 (50)
2. <i>Tylenchorhynchus</i>	40-210 : 165 (33.3)	20-210 : 102 (83.3)	10-150 : 48 (100)	30-220 : 125 (100)	30-110 : 87 (75)
3. <i>Hoplolaimus</i>	-	-	60 : 60 (16.6)	-	-
4. <i>Pratylenchus</i>	-	-	20 : 20 (16.6)	-	20 : 20 (25)
5. <i>Hirschmanniella</i>	20-350 : 190 (100)	250-1010 : 542 (100)	20-1230 : 428 (100)	210-390 : 283 (100)	30-190 : 57 (75)
6. <i>Longidorus</i>	-	10 : 10 (16.6)	-	-	-
7. Other dorylaims	190-1060 : 635 (100)	330-1320 : 647 (100)	180-720 : 405 (100)	170-290 : 183 (100)	200-960 : 400 (100)
8. Saprohagous	30-240 : 108 (100)	40-160 : 142 (16.6)	70-210 : 127 (100)	30-150 : 93 (100)	80-100 : 76 (75)

Table I contd.

## Results of the survey of Paddy crop in Malda district, West Bengal.

	LOCALITY / VILLAGE			
	Gabgachi	Pukherpara	Srirampur	Banriatola
No. of samples collected	2	4	5	4
Nematode associated				
1. <i>Meloidogyne</i>	100-120 110 (100)	20-40 : 30 (100)	20-120 56 (100)	20 20 (50)
2. <i>Tylenchorhynchus</i>		10 : 10 (25)	40-260 152 (100)	30-270 : 148 (100)
3. <i>Hoplolaimus</i>	-	-	40 40 (20)	-
4. <i>Pratylenchus</i>	20-290 155 (100)	-	200 : 200 (20)	-
5. <i>Hirschmanniella</i>	30-310 : 170 (100)	100-850 : 358 (100)	20-900 450 (100)	600-1020 : 815 (100)
6. <i>Longidorus</i>	-	-	-	-
7. Other dorylaims	210-440 325 (100)	70-420 : 235 (100)	320-1160 : 652 (100)	280-410 : 350 (100)
8. Saprophagous	160 : 160 (100)	20-170 : 73 (100)	60-180 : 120 (100)	60-380 : 148 (100)



**TABLE - II**

Results of the survey of Paddy crop in Jalpaiguri district, West Bengal.  
Range of nematode number with its average per 200 ml of soil.  
Figures in parenthesis indicate percent frequency of occurrence.

	LOCALITY / VILLAGE				
	Hakimpara	Mohitnagar	Dhabgunj	Dangapara	Dethapara
No. of samples collected	2	5	5	2	5
Nematode associated					
1. <i>Meloidogyne</i>	10-200 : 115 (100)	10 : 10 (20)	30 : 30 (20)	20-350 : 185 (100)	20-370 : 195 (40)
2. <i>Tylenchorhynchus</i>	-	-	-	-	70-100 : 85 (40)
3. <i>Helicotylenchus</i>	-	-	-	10 : 10 (50)	-
4. <i>Pratylenchus</i>	-	-	-	-	-
5. <i>Hirschmanniella</i>	60-70 : 65 (100)	30-240 : 135 (40)	20-120 : 70 (100)	20-40 : 30 (100)	20-240 : 136 (100)
6. <i>Hemicriconemoides</i>	-	-	30 : 30 (20)	-	-
7. Other tylenchids	-	-	-	-	30-40 : 35 (40)
8. Other dorylaims	80-110 : 95 (100)	80-520 : 318 (100)	110-240 : 156 (100)	80-150 : 115 (100)	20-90 : 45 (100)
8. Saprophagous	30-600 : 315 (100)	40-80 : 62 (100)	10-50 : 40 (100)	40-70 : 55 (100)	20-110 : 57.5 (100)

Table - II contd.

## Results of the survey of Paddy crop in Jalpaiguri district, West Bengal.

	LOCALITY / VILLAGE				
	Choto Chowdhury para	Habupara	Brahmatal	Sakarpara	Dangapara II
No. of samples collected	6	4	5	1	7
Nematode associated					
1. <i>Meloidogyne</i>	30-80 : 55 (33)	10-80 : 45 (50)	10-30 : 16 (60)	-	20-230 190 (57)
2. <i>Tylenchorhynchus</i>	10 : 10 (16.7)	10 : 10 (25)	20-150 : 85 (40)	20	-
3. <i>Helicotylenchus</i>	-	-	-	160	-
4. <i>Pratylenchus</i>	-	-	-	20	-
5. <i>Hirschmanniella</i>	30-210 : 96.7 (100)	90-160 : 125 (100)	20-110 : 50 (100)	20	20-410 118 (100)
6. <i>Hemicriconemoides</i>	-	-	-	-	-
7. Other tylenchids	-	20-40 : 30 (100)	10-40 : 25 (40)	-	-
8. Other dorylaims	10-390 : 135 (100)	30-190 : 130 (100)	130-270 : 186 (100)	390	10-130 : 86 (100)
9. Saprophagous	20-80 : 43 (100)	20-50 : 40 (100)	10-50 : 30 (100)	120	10-170 : 50 (100)

**TABLE - III**

Comparative results of the survey of Paddy crop in Malda and Jalpaiguri districts, West Bengal State.  
 Range of important nematode number (potential parasites) with its average per 200 ml of soil and 10 gm roots.  
 Figures as parenthesis indicate percent frequency of occurrence with dominance in soil/only occurrence in roots.

Name of the district	<u>Malda</u>		<u>Jalpaiguri</u>	
	Soil Population	Root Population	Soil Population	Root Population
<b>Potential Nematodes</b>				
1. <i>Meloidogyne</i>	10-460 : 72.5 (80 : 7.5)	2-664 : 119 (70)	10-350 : 56.5 (66 : 20)	2-128 : 97 (66.0)
2. <i>Tylenchorhynchus</i>	10-270 : 102 (72.5 : 15)	-	10-150 : 65 (26 : 7)	-
3. <i>Hirschmanniella</i>	20-1230 : 404 (97.5 : 77.5)	4-82 : 18 (97.5)	20-240 : 77.5 (90.5 : 73)	1-40 : 6 (90.5)