

# Diversity of Plant Parasitic nematode Genus associated with vegetable crops in Kammapuram block of Cuddalore district, Tamil Nadu

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## Abstract

A random survey was made in Kammapuram block of Cuddalore district, eleven genus of plant parasitic nematodes were found associated with eight vegetable crops in Kammapuram block, The nematode genera viz., *Hoplolaimus spp.* and *Rotylenchulus spp.* were found to associated with all the vegetable crops. However, density was highly variable from field to field and within the same locality. The *Meloidogyne spp.* is occurred in higher absolute density (64.58/100cc soil) when compared to other nematodes. The prominence value (3.86) also recorded higher for *Meloidogyne spp.* The ectoparasitic nematode, *Tylenchorhynchus spp.* recorded in higher density (27.71 /100 cc soil) next to root-knot nematode and found with the absolute frequency of 62.5 %. The *scutellonema spp.* recorded only in samples collected from elephant foot yam.

## Introduction

Plant-parasitic nematodes are the major biotic stressor in crop cultivation. Correct identification of nematode species is essential for choosing the proper methods of control. The economic consequences of crop losses caused by nematodes come in many variations and are associated with a decrease in the crop quality and yield. The assessment of such losses and periodic updates of these estimates may be of great use to set research priorities. In addition to that, it can serve as a benchmark for policy planners (Kumar *et al.*, 2020).

## Materials and methods

This work focused on investigating the plant-parasitic nematodes that affect vegetable crops. The study took place in the Kammapuram block of Cuddalore district (Tamil Nadu) between May 2019 and May 2020 and involved 64 samples of soil and roots of eight different vegetable crops viz., chillies, tapioca, brinjal, snakegourd, gogra, bhendi, bittergourd and Elephant foot yam. These locations

were selected based on their level of importance for vegetable production. In each location, there were three samples per crop randomly taken. A representative sample (100 cc soil + 10 g root) of each location was collected.

Nematodes were extracted separately from roots and soil the each collected sample. The roots were gently washed to remove as much soil as possible and then cut into pieces of about 0.6 cm. Nematodes were removed from the 10 - gram root sample using the modified Berman method for 48 h. The suspensions of nematodes were collected in beakers then the supernatant was poured into a 10 ml tube and mixed with hot (65 °C) 4% formalin. The tubes were kept in a refrigerator at 4 °C until nematodes were identified and their population density assessed. Endoparasitic nematodes were examined on a root tissue using a stereoscopic microscope (15 × magnification). Nematode genus identification was done based on the morphological characters. The density of each plant parasitic nematodes (both root and soil) was counted in each sample. Community analysis of the genus was done by using Norton's formula.

Absolute Frequency %	=	$\frac{\text{Number of samples containing species}}{\text{Total number of samples examined}} \times 100$
Relative Frequency %	=	$\frac{\text{Frequency of species}}{\text{Sum of frequencies of all species}} \times 100$
Absolute density	=	$\frac{\text{No. of individuals of species in a sample}}{\text{Volume /mass /unit of sample}}$
Relative density %	=	$\frac{\text{Density of the species}}{\text{Sum of mean density of all nematode species}} \times 100$
Prominence Value	=	$\text{Density} \times \sqrt{\text{Frequency}}$

**Table 1. Occurrence of plant parasitic nematodes in vegetable crops in Kammapuram block of Cuddalore district. Agro climatic features of surveyed block in Cuddalore District, Tamil Nadu.**

Block	: Kammapuram
Soil type	: Lateritic
Altitude m MSL	: 78 – 92
Latitude (°N)	: 11.656
Longitude (°E)	: 79.407
Average rainfall (mm)	: 1227
Average annual temperature °C	: 29.76
Mean Relative Humidity	: 64.72
Soil pH	: 7.21
Village surveyed	: Marugur, Palakottai, V. Kolapakkam, Irulankuruchi, Aladi, Nadiyapattu, Manakollai, Vadakuthu
Number of sale collected	: 64 nos

### Result and Discussion

Eleven genus of plant parasitic nematodes viz., *Helicotylenchus spp.*, *Pratylenchus spp.*, *Rotylenchulus spp.*, *Xiphinima spp.*, *Hoplolaimus spp.*, *Longidorus spp.*, *Tylenchorhynchus spp.*, *Criconea spp.*, *Meloidogyne spp.*, *Radopholus spp.*, and *Scutellonema spp.*, were found associated with eight vegetable crops in Kammapuram block (Table 1), The nematode genera viz., *Hoplolaimus spp.* and *Rotylenchulus spp.* were found to associated with all the vegetable crops. However, density was highly variable from field to field and with in the same locality. The *Meloidogyne spp.* is occurred in higher absolute density (64.58/100cc soil) when compared to other nematodes. The prominence value (387.10) also recorded higher for *Meloidogyne spp.* The ectoparasitic nematode, *Tylenchorhynchus spp.* recorded in higher mean population density (27.71 /100 cc soil) next to root-knot nematode and found with the absolute frequency of 62.5 %. The *scutellonema spp.* recorded only in samples collected from elephant foot yam crops.

It is concluded from the study that *Meloidogyne spp.* is predominant species of nematode, infesting all the vegetable crops grown at Kammapuram block of Cuddalore district, Tamil Nadu. This might be due to fact that *Meloidogyne spp.* is polyphagous in nature and availability of susceptible suitable host through out the year. The dominance of *Meloidogyne sp.* on vegetable crops was previously reported by other researchers, who observed that these nematode species are abundant in vegetable farming. Root Knot Nematode causing yield losses in essential vegetable crops, such as cucumber (85%), tomato (59%), zucchini (40%), watermelon 36%, and lettuce (29%) (Gullino *et al.*, 2019). These findings may serve as a frame work for further research aimed at the improvement of vegetable pest control and will pay the growers attention to control infestation by Plant Parasitic nematodes

### References

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**Table 1. Occurrence of plant parasitic nematodes in vegetable crops in Kammapuram block of Cuddalore district**

S. n	Nematode species	Soil samples collected from Vegetable crops & No. of plant parasitic nematodes containing samples									
		Chillies	Tapioca	Brinjal	Snake gourd	Gogra	Bhendi	Bitter gourd	Yam	Total number of sample containing species.	Frequency of occurrence (%)
		10*	5*	15*	8*	5*	10*	8*	3*	64*	
1	<i>Helicotylenchus spp.</i>	8	0	11	5	5	5	3	3	40	62.00
2	<i>Pratylenchus spp.</i>	4	0	6	3	4	3	1	3	24	37.50
3	<i>Rotylenchulus spp.</i>	10	2	11	4	4	7	4	3	45	70.00
4	<i>Xiphinema spp.</i>	4	2	5	5	4	6	2	0	28	43.75
5	<i>Hoplolaimus spp.</i>	5	2	10	1	3	4	3	2	30	46.00
6	<i>Longidorus spp.</i>	3	0	2	3	0	3	0	0	11	17.18
7	<i>Tylenchorhynchus spp.</i>	6	2	12	8	4	5	3	0	40	62.50
8	<i>Criconema spp.</i>	4	0	4	2	0	6	1	0	17	26.56
9	<i>Meloidogyne spp.</i>	5	0	10	2	0	5	1	0	23	35.93
10	<i>Radopholus spp.</i>	4	0	0	0	2	3	1	1	11	17.18
11	<i>Scutellonema spp</i>	0	0	0	0	0	0	0	3	3	4.68

Note: Numbers indicated by the \* is total samples collected in different vegetables

**Table 2. Mean density of Plant parasitic nematodes (100 cc soil) associated with vegetable crops in Kammapuram block of Cuddalore district**

S.no	Vegetable crops	Plant Parasitic nematode genus										
		<i>Helicotylenchus spp.</i>	<i>Pratylenchus spp.</i>	<i>Rotylenchulus spp.</i>	<i>Xiphinema</i>	<i>Hoplolaimus spp.</i>	<i>Longidorus spp.</i>	<i>Tylenchorhynchus spp.</i>	<i>Criconea spp.</i>	<i>Meloidogyne spp.</i>	<i>Radopholus spp.</i>	<i>Scutellonema spp.</i>
1.	Chillies	43.37	21.75	42.3	6.25	34.2	5.33	49	20.25	128.5	11.5	0
2	Tapioca	35.8	0	13.5	6.5	11	0	26.5	0	0	0	0
3	Brinjal	33.13	20.83	23.1	15.4	22.2	21.2	39.17	9.5	126.6	0	0
4	Snakegourd	30.91	31	35.5	21.2	20	18	15	7	79	0	0
5	Gogra	12.5	14.5	11.75	15.25	30	0	20.25	0	0	14.5	0
6	Bhendi	24.66	34.66	45.42	25.33	19.25	22.66	37.4	12.66	132.6	14.3	0
7	Bittergourd	22.75	19	8.75	21.5	50.33	0	8.66	8	50	9	0
8	Yam	11.0	33.33	4	0	0	0	25.7	0	0	5	27
	Total	214.12	175.07	184.32	111.43	186.98	67.19	221.68	57.41	516.7	54.3	27
	Mean	26.76	21.88	23.04	13.93	23.37	8.39	27.71	7.18	64.57	6.78	3.37

**Table 3. Community analysis of nematodes associated with vegetable crops in Kammapuram block of Cuddalore district**

S.no	Nematode species	Absolute density	Relative density	Absolute frequency	Relative frequency	Prominence value
1	<i>Helicotylenchus</i> spp.	26.76	11.79	62	14.64	210.70
2	<i>Pratylenchus</i> spp.	21.88	9.64	37.5	8.85	133.98
3	<i>Rotylenchus</i> spp.	23.04	10.15	70	16.53	192.76
4	<i>xiphinima</i> spp.	13.93	6.16	43.75	10.33	92.138
5	<i>Hoplolaimus</i> spp.	23.37	10.29	46	10.86	158.50
6	<i>Longidorus</i> spp.	8.41	3.69	17.18	4.05	34.85
7	<i>Tylenchorhynchus</i> spp.	27.71	12.37	62.5	14.76	219.06
8	<i>Criconea</i> spp.	7.17	3.16	26.56	6.27	36.95
9	<i>Meloidogyne</i> spp.	64.58	28.45	35.93	8.4	387.10
10	<i>Radopholus</i> spp.	6.78	3.1	17.18	4	28.10
11	<i>Scutellonema</i> spp.	3.37	1.15	4.68	1.1	7.29

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