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N Ashokkumar
Ph.D. Scholar, Department of
Nematology, Tamil Nadu
Agricultural University,
Coimbatore, Tamil Nadu, India

K Poornima
Professor and Head, Department
of Nematology, Tamil Nadu
Agricultural University,
Coimbatore, Tamil Nadu, India

Occurrence and distribution of root knot nematode, *Meloidogyne enterolobii* in guava (*Psidium guajava* L.) in Tamil Nadu

N Ashokkumar and K Poornima

Abstract

Survey was done in major guava growing districts of Tamil Nadu viz., Coimbatore, Erode, Theni, Madurai, Krishnagiri, Dharmapuri, Villupuram, Thiruvannamalai and Dindigul for incidence for guava root knot nematode, *M. enterolobii* was found to be positive in all districts. *M. enterolobii* infested guava orchards in each district surveyed had revealed appropriate symptoms such as bronzing of leaves with marginal necrosis, simple and compound galls in the roots and browning of younger and older leaves which finally resulted in wilting of the infested plants. The investigation from this survey revealed highest population of *M. enterolobii* both in 200g soil (414) and 5g roots (588) in Theni district while the lowest population was found at Villupuram district with 263 per 200g soil and 467 per 5g root.

Keywords: Survey, Tamil Nadu, orchard, *M. enterolobii* and compound galls

Introduction

Guava (*Psidium guajava* L.) also called as 'poor man's apple' is one of the important commercial fruits in India, occupying an area of 2.03 lakh hectares with an annual production of 22.7 lakhs MT. Major guava growing states in India are Uttar Pradesh, Bihar, West Bengal, Maharashtra, Chattisgarh, Tamil Nadu, Karnataka, Madhya Pradesh, Gujarat and Andhra Pradesh. Recently, in Tamil Nadu *M. enterolobii* was detected in Ayakudi (Dindigul district) on guava (*Psidium guajava*) as first record from India [1]. Considering the risk of introduction and dissemination of the pest, *Meloidogyne enterolobii* was recently added in EPPO A2 list (No. 361, OEPP/ EPPO Bulletin, 2014). *M. enterolobii* has been considered as a matter of grave concern, because it has been spreading rapidly and makes the cultivation of guava unviable in heavily infested areas [5]. The root knot nematode (*M. enterolobii*), generally occur in polyspecific communities, interacts in a dynamic way with the host plant, environment and other organisms present in the rhizosphere. The present study was taken up to study the distribution pattern of this nematode.

Materials and methods

Nematode distribution: A survey was conducted from the major guava growing areas of different districts of Tamil Nadu viz., Coimbatore, Erode, Theni, Madurai, Krishnagiri, Dharmapuri, Villupuram, Thiruvannamalai and Dindigul (Table 1). Soil (200gm) along with feeder roots were collected and transferred in to the polythene bags and tied with rubber band to check evaporation. Supporting data regarding coordinates, crop, variety, date of collection was tagged with the bag. The samples were then brought to the nematology laboratory (Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India) for further processing.

Extraction of nematodes from soil

For extraction of nematodes from the soil, Cobb's decanting and sieving method followed by Baermann's funnel technique [7] was followed by using a series of sieves (20, 60, 150 and 350 mesh). After 24 hours the nematode suspension was collected and examined under a stereo zoom binocular microscope.

Extraction of nematodes from root

For extraction of nematodes from root, Acid fuchsin - Lactophenol method [6] was followed. Root samples of known quantity were taken, thoroughly washed and soaked in 3% sodium hypochlorite (NaOCl) for 2 min and then washed in distilled water resulting that the samples were free from residue. The washed roots were then added into a small beaker containing boiling acid fuchsin + lactophenol solution (stock solution was prepared by dissolving 1g of

Correspondence

K Poornima
Professor and Head, Department
of Nematology, Tamil Nadu
Agricultural University,
Coimbatore, Tamil Nadu, India

acid fuchsin stain in 100 ml of water, from this stock solution 5 ml was mixed in 100 ml lactophenol) and heated for three min or until the formation of bubbles in the solution. These stained roots were washed in tap water to remove the excess stain and transferred to a beaker containing plain lactophenol solution and allowed to be undisturbed for 12hrs for destaining. The stained adult females of *M. enterolobii* nematode on roots were observed and counted under stereoscopic binocular microscope.

Results

Nematode distribution

The survey was conducted in guava growing areas of Tamil Nadu viz., Coimbatore, Erode, Theni, Madurai, Krishnagiri, Dharmapuri, Villupuram, Thiruvannamalai and Dindigul. It was observed that root knot nematode, *M. enterolobii* infested guava orchards in each of the district surveyed had symptoms such as bronzing of leaves with marginal necrosis, presence of simple and compound galls in the roots and browning of younger and older leaves, results in wilting of plants. The result from this survey concluded that the incidence and population of root knot nematode, *M. enterolobii* was found to be highest in Root (Theni (588), Dindugul (467), Dharmapuri (454), Coimbatore (452), Erode (404), Thiruvannamalai (393) Krishnagiri (371), Madurai (268) and lowest population was found in Villupuram (159). Whereas in soil the highest population were found in Theni (414), Thiruvannamalai (317), Dharmapuri (305), Coimbatore (292), Krishnagiri (276), Erode (267), Madurai (245), and lowest in Villupuram (109). Thus concluded that Theni was highly infested with *M. enterolobii* and Villupuram were less affected. Wherever it was combined with fungal infection, the plants showed sudden death of plants.

In the case of guava root knot nematode, *M. enterolobii*, the number of females may be few in simple galls and many in compound galls, with long necks with a bulb like posterior, crowding to reach the pericycle area. This enormous crowding seems to cause choking of the stealer region which ultimately results in disruption of the vascular bundles and its function.

Discussion

Nematode distribution

Root-knot nematodes *Meloidogyne* spp. is a group of several species, but the most common species occurring world-wide are four i.e. *Meloidogyne incognita*, *M. javanica*, *M. arenaria* and *M. hapla*. The root-knot nematode *M. enterolobii* is a new record from India in guava [1] and has found to be cause massive decline in guava orchards across India and other parts of the world. The investigation has clearly indicated that the association of root knot nematode, *M. enterolobii* with guava was highly pathogenic in nature [2]. But in case of Tamil Nadu, *M. enterolobii* cause severe yield loss to guava orchards, first record from India [1, 4]. Reported that *M. enterolobii* (syn *M. mayaguensis*) was a polyphagous plant parasitic nematode causing severe damage in several plant species in Brazil. This study was conducted in major guava growing districts of Tamil Nadu. During this survey *M. enterolobii* infestation was observed in guava from all the major guava growing districts [3]. Observed that guava decline was a complex disease which attains parasitism by *M. enterolobii* results in yellowing, wilting, scorching of leaf margins and leaf drop, yield reduction and plant death within few months. Similar kinds of symptoms were also observed during survey.

Table 1: Occurrence of root knot nematode, *M. enterolobii* in Tamil Nadu

S. No	Location	Cultivar	Nematode population in roots			Nematode population in soil 200cc
			No. of egg mass/5g root	No. of females/gall	No. of eggs/egg mass	
	Theni					
1	Uthamapalayam	Banaras	28	21	125	84
2	Uthamapalayam	Banaras	31	18	109	82
3	Uthamapalayam	L-49	29	14	112	99
4	Chinnamanoor	L-49	27	20	140	77
5	Cumbam	Arka Kiran	24	16	102	72
		Total			588	414
	Madurai					
6	Melur	Taiwan	17	14	97	89
7	Melur	Taiwan	16	13	84	77
8	Melur	Taiwan	27	9	87	79
		Total			268	245
	Dharmapuri					
9	Nekkunthi	L-46	48	19	109	94
10	Nallampalli	Allahabad Safeda	54	24	109	67
11	Dharmapuri	L-49	43	16	112	76
12	Mookanur	Hisar Lalit	51	27	124	68
		Total			454	305
	Krishnagiri					
13	Kaveripattinam.	Taiwan Pink	48	24	98	83
14	Kaveripattinam.	Taiwan Pink	53	21	80	71
15	Kaveripattinam.	Taiwan Pink	41	26	92	69
16	Kaveripattinam.	Taiwan Pink	38	19	101	53
		Total			371	276
	Villupuram					
17	Ulundurpet	Hisar Lalit	29	12	79	43
18	Ulundurpet	Hisar Lalit	24	8	80	66
		Total			159	109

	Dindigul					
19	Palani	L-49	47	34	121	74
20	Palani	L-49	53	29	109	82
21	Amarapoondi	Banaras	51	31	116	58
22	Amarapoondi	Banaras	56	36	121	49
	Total				467	263
	Coimbatore					
23	Thondamuthur	L-49	20	28	92	63
24	Thondamuthur	L-49	24	24	82	54
25	Thondamuthur	L-49	16	27	89	43
26	Thondamuthur	L-49	21	31	94	59
27	Karmadai	L-49	46	24	95	73
	Total				452	292
	Thiruvannamalai					
27	Avoor	L-49	24	26	94	68
28	Avoor	L-49	27	37	93	74
29	Avoor	L-49	31	31	102	86
30	Avoor	L-49	29	35	104	89
	Total				393	317
	Erode					
31	Anthiyur	L-46	19	16	89	78
32	Anthiyur	L-46	21	13	107	61
33	Anthiyur	L-46	19	17	99	56
34	Anthiyur	L-46	24	19	109	72
	Total				404	267

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