



SURVEY OF PLANT PARASITIC NEMATODES ASSOCIATED WITH GERBERA IN TAMIL NADU

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ABSTRACT

A survey was conducted in the different districts of Tamil Nadu in the year of 2013 in order to determine the most important plant parasitic nematodes species associated with gerbera. The analysis of soil and root samples collected from the rhizosphere of gerbera in each district revealed the presence of only five species of plant parasitic nematodes. These are *Meloidogyne incognita*, *Helicotylenchus multicinctus*, *Pratylenchus coffeae*, *Tylenchorhynchus* spp. and *Rotylenchulus reniformis*. The present investigation revealed that *M. incognita* is one of the serious limiting factors in commercial cultivation of gerbera under polyhouse conditions present in Tamil Nadu.

KEY WORDS: Plant parasitic nematodes, Survey, Gerbera, Tamil Nadu, *Meloidogyne incognita*.

INTRODUCTION

Gerbera is one of the ten most popular commercial cut flowers in the world and according to the global trends in floriculture; it occupies the fourth place among cut flowers (Choudhary and Prasad, 2000). There is very good demand for the flowers both in the domestic and international markets. Cultivation of gerbera on commercial scale for domestic and export purpose is relatively recent in India. These crops are being grown under hi-tech and controlled environmental conditions, mainly in and around cities like Bangalore, Calicut, Coimbatore, The Nilgiris, Hosur, Delhi, Nasik, Pune, Srinagar, besides few other places in Karnataka, Tamil Nadu, Maharashtra, Uttar Pradesh, Punjab, etc. In Karnataka, these are grown in and around cities Bangalore and Belgaum and presently Belgaum is having polyhouse area of 12.5 ha in which carnation and gerbera are being cultivated. Of the several limiting factors that cause serious concern to commercial production, plant parasitic nematodes are most important. Although a multitude of plant parasitic nematodes are found associated with carnation and gerbera elsewhere in the world (Lamberti *et al.*, 1987), root knot nematodes belonging to *Meloidogyne* spp. are predominant in India (Nagesh and Parvath Reddy, 2001). Throughout the world in ornamental crops, plant parasitic nematodes are responsible for 11.1 % losses (Sasser and Freckman, 1987). In India, yield loss in carnation due to *Meloidogyne incognita* was reported to be 26.6% (Nagesh and Parvath Reddy, 2000) and in gerbera, the loss was recorded to an extent of 31.1 % (Nagesh and Parvath Reddy, 2000). Keeping in view of the disturbing nature of this pest, the present study was undertaken to examine the plant parasitic nematodes associated with gerbera grown districts of Tamil Nadu.

MATERIALS & METHODS

A survey of plant parasitic nematodes associated with gerbera was conducted in different districts of Tamil Nadu

viz., Coimbatore, The Nilgiris, Salem and Krishnagiri in the year of 2013. Soil and root samples of plants exhibiting nematode symptoms were collected and analyzed for plant parasitic nematodes. A total of 20 samples collected from a depth of 15-20 cm in rhizosphere region of 10-15 plants / spots at random, representing one polyhouse. Each sample consisted of 50 cc of soil and 1 g of root. Later, these samples were pooled to draw a representative sample of 200 cc of soil and 5 g of root. All the samples were stored in polythene bags and sealed tightly with label for nematode extraction. The soil samples were processed by Cobb's decanting and wet sieving method (Cobb, 1918) followed by Modified Baermann's funnel method (Schindler, 1961). The root sample more thoroughly washed in running tap water finely chopped and thoroughly mixed. Five grams of these composite samples were stained in acid fuchsin and lactophenol method, and the nematode population in root was estimated by extraction through maceration by using a warring blender. Nematodes collected from soil samples were killed in hot water and later fixed in 4% formaldehyde solution. Nematode population as estimated by using a stereoscope microscope and the range was determined. Plant parasitic nematodes were identified up to genus/species level by using standard monograph. The species of root knot nematode was identified by its perennial pattern.

Identification of root knot nematode species associated with gerbera

The species identity of *M. incognita* was confirmed by studying the morphological characters and by using the taxonomic key. Root samples were stained by acid fuchsin lactophenol method. After destaining with plain lactophenol the adult females were excised randomly from the stained roots, ten adult females were selected randomly and used for species identification through posterior cuticular pattern (PCP).

Preparation of posterior cuticular pattern

The cuticle of root knot nematode adult female near the neck region was cut to push the body tissue content. Then the cuticle was placed in a drop of 45% lactic acid and kept for 30 min. afterwards, the cuticle was cut into half (equatorially) with scalpel blade and removed the cuticle with perineal pattern with a drop of 45% lactic acid and trimmed the perineal pattern to a square shape. The trimmed perineal pattern placed back into the 45% lactic acid to clean the debris thoroughly from the perineal pattern. The perineal pattern again transferred to a drop of glycerine on a clean glass microscope slide to align the perineal pattern in straight line and to orient the anus down. The interior surface of the cuticle placed against the

glass slide and pressed gently with another glass slide to view the perineal pattern and compared with the perineal patterns of the most common species of root knot nematode to identify the species of *Meloidogyne* in the present study (Hartman and Sasser, 1985).

RESULT & DISCUSSION

From 20 samples examined, only five species of plant parasitic nematodes were found in the rhizosphere of the gerbera plants. They are *Meloidogyne incognita*, *Helicotylenchus multicinctus*, *Pratylenchus coffeae*, *Tylenchorhynchus* spp. and *Rotylenchulus reniformis* (Table 1).

TABLE 1. Nematode associated with gerbera under polyhouse condition

S. No.	District	Location	Nematode	Population Range /200 cc soil
1	Coimbatore	Kembanur	<i>M. incognita</i>	57-64
			<i>Helicotylenchus multicinctus</i>	43-52
			<i>Pratylenchus coffeae</i>	7-12
			<i>Tylenchorhynchus</i> spp.,	3-9
			<i>Rotylenchulus reniformis</i>	6-8
2	The Nilgiris	Pudhumandhu	<i>M. hapla</i>	39-52
			<i>Helicotylenchus multicinctus</i>	36-45
			<i>Pratylenchus coffeae</i>	15-21
			<i>Tylenchorhynchus</i> spp.	-
			<i>Rotylenchulus reniformis</i>	-
3	Salem	Yercaud	<i>M. incognita</i>	68-77
			<i>Helicotylenchus multicinctus</i>	41-59
			<i>Pratylenchus coffeae</i>	8-14
			<i>Tylenchorhynchus</i> spp.	-
			<i>Rotylenchulus reniformis</i>	-
4	Krishnagiri	Santhanapalli	<i>M. incognita</i>	53-62
			<i>Helicotylenchus multicinctus</i>	38-53
			<i>Pratylenchus coffeae</i>	9-21
			<i>Tylenchorhynchus</i> spp.	4-10
			<i>Rotylenchulus reniformis</i>	2-7

These results are in confirmation with the findings of Ardhanareeswaran (2012) who reported similar species of nematodes from rhizosphere soils and roots of gerbera from the Nilgiris and (Kodaikanal) Dindugul districts of Tamil Nadu. The results are also in accordance with the results obtained by Chandel *et al.* (1997) who during a survey a plant parasitic nematode (*Meloidogyne incognita*) on gladiolus, in Solan and Shimla districts of H.P., India. Nirmal Johnson (2000) reported during his survey, similar plant parasitic nematodes associated with crops *viz.*, carnation, gerbera, gladiolus and asiatic lily in greenhouses of Tamil Nadu. The results of the survey were also in accordance with the findings of Jagirdar (2005) who surveyed for the nematodes associated with the carnation and gerbera and found *Meloidogyne* spp. and *Helicotylenchus* spp. as predominant nematodes. Identification of root knot nematode through posterior cuticular pattern is widely followed method especially for the major root knot nematode species *viz.*, *M. incognita*, *M. javanica*, *M. arenaria* and *M. hapla* (Chitwood *et al.*, 1949 and Eisenback, 1985) in other crops. The species of

root knot nematode associated with gerbera was identified as *M. incognita* based on conventional method of markings in the posterior cuticular pattern which is characterized by high squarish dorsal arch weavy and broken lines which have a tendency of forking at the lateral sides (Fig. 1). Accurate identification of *Meloidogyne* spp. infesting gerbera is a prerequisite for the efficient use of host plant resistance and effective management of the nematode. *M. incognita* were found in three districts *viz.*, Coimbatore, The Nilgiris, Salem and Krishnagiri and the population ranged from 57-64, 68-77 and 53-62 respectively. *M. hapla* were found only in the samples collected from Nilgiris district and the population ranged from 39-52. Above ground symptoms of damage caused by root knot nematode in gerbera were yellowing of leaves, stunting of plants, reduced leaf size and wilting of plants. Below ground symptoms *viz.*, presence of small to medium size root galls, rotting of roots and reduced root system were observed when the infested plants were uprooted (Fig. 2).

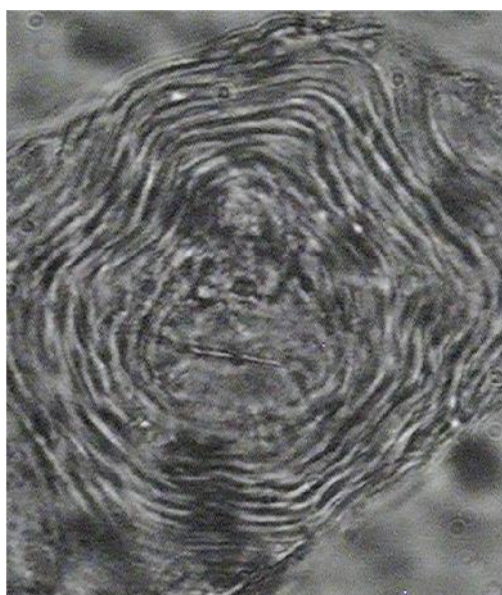


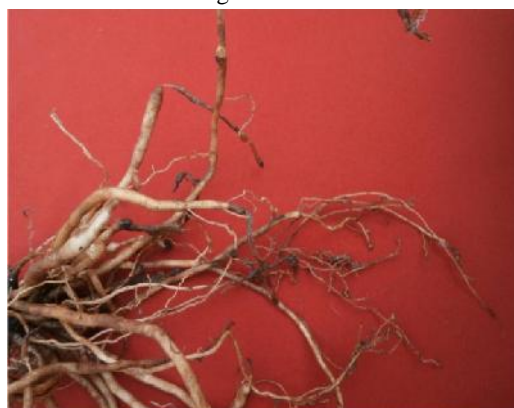
FIGURE 1. Perineal pattern of *M. incognita*



Yellowing of leaves



Wilting of plant



Rotting of roots



Presence of small to medium sized root galls

FIGURE 2. Symptoms caused by Root knot nematode in gerbera

The number of *Helicotylenchus multicinctus* vary from 36-59 encountered in all the four districts of Tamil Nadu. *Pratylenchus coffeae* were encountered from all the four districts of Tamil Nadu viz., Coimbatore, The Nilgiris, Salem and Krishnagiri and the population ranged from 7-12, 15-21, 8-14 and 9-21 respectively. *Tylenchorhynchus*

spp. and *Rotylenchulus reniformis* were not present in samples collected from The Nilgiris and Salem districts. In the present investigation, *M. incognita* is found to be the major nematode menace in gerbera polyhouses present in Tamil Nadu. This was followed by *Helicotylenchus multicinctus*.

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