Int.J.Curr.Microbiol.App.Sci (2018) *7*(2): 2990-2994

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 7 Number 02 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.702.364

Locating Hotspots and Identification of Plant Parasitic Nematode Associated With *Chrysanthemum* in Karnataka, India

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Keywords

Hotspots, Plant parasitic nematode, *Chrysanthemum*

Article Info

Accepted:
26 January 2018
Available Online:
10 February 2018

A B S T R A C T

The present study makes an attempt to identify the plant parasitic nematode associated with chrysanthemum in Karnataka. The primary data was collected using random sampling technique Bagalkote, Gadag, Dharwad and Belgum comprising total nine villages were selected for study during the year 2012-2014. The findings reveals that, the plant parasite nematode were found to be eight species, *viz*., *Meloidogyne*, *Helicotylenchus*, *Tylenchulus*, *Xiphinema*, *Pratylenhus*, *Hemicyclophora*, *Hoplolaimus* and *Radopholus* which were commonly found in the roots of commercially cultivated chrysanthemum flower crops. Further, the study also identified, in Belgaum district at 13 different location *Pratylenchus* and *Meloidogyne* sp. occurred more frequently with 60 to 100 per cent absolute frequency. Similarly, in case of Dharwad district, *Pratylenchus, Helicotylenchus, Meloidogyne* and *Tylenchus* sp. were more frequent with 100 per cent distribution and abundant. In addition, in case of Gadag district, *Pratylenchus* had the 100 per cent frequency with highest absolute density (110). However, whereas in Bagalkote district, *Meloidogyne* revealed highest frequency distribution (100 %) and absolute density (300) when compared to other districts during the study period. Hence the study suggests that suitable plant protection measures need to be adopted for the appropriate nematode species control in these areas and also areas and also areas which have similarly agroclimatic features.

Introduction

The name "*Chrysanthemum*" is derived from the Greek words *chrysos* (gold) and *anthemon* (flower). *Chrysanthemums*, sometimes called mums or chrysanths, which are flowering plants of the genus *Chrysanthemum* in the family Asteraceae. They are native to Asia and northeastern Europe. It is one of the commercial plants for cultivated all over country for both local consumption for prayer and globally in traditional poojas at temple. In large scale in addition to this flowers and leaves have medicinal and pharmaceutical uses. Edible *Chrysanthemum* has many medicinal uses as well. It is diuretic, cold, nutritive, tonic, blood purifying, anti-inflammatory in action and found useful in blood purification, urinary stones, fluid retention, swelling of feet, cosmetic purpose

etc. (Anupama February 4, 2015) The plant parasitic nematodes as pests of different horticultural and field crops are responsible for an annual loss to our farmers. Nematode problems are more severe and complicated in warmer than cooler areas, in horticultural than field crops, mono-culture than multi-culture, plantation crops than natural forests and vegetation. Horticultural crops are more efficient producers of biomass and harvestable produce than the agronomical crops. Nematodes pose a constraint to horticultural development and intensive cultivation. It has been estimated that annually an average 6% loss in field crops, 12% in fruit and nut crops and 11% in vegetables and 10% in ornamental crops is due to nematode infections. Besides causing quantitative losses, nematodes are known to reduce vitamins and minerals in edible plant parts. Nematode damage is less obvious and many a times goes unnoticed. It causes gradual decline in yield. Nematodes cause complex diseases in association with other soil-borne pathogens (Sandeepa, 2011).

Materials and Methods

The present studies were conducted to identify the frequently encountered pathogenic nematode species on the commercial flower crops *Chrysanthemum*. During the year 20212-14, the studies were conducted in the Department of Horticulture Plant Pathology, College of Horticulture, Arabhavi of Belgaum district which is situated in agroclamatic Zone-8, Region-4 of Karnataka state at 15^0 43' north latitude and 74^0 25' east longitudes.

Survey and identification of nematode

A nematode random survey on major plant parasitic nematodes associated with *Chrysanthemum* flower crops, grown in different open field conditions at Belgaum, Gadag, Dharwad and Bagalkot districts of north Karnataka (India) was carried out during 2012-2013 and 2013-2014. The sampling was done based on plants showing nematode symptoms such as yellowing, poor growth or stunted growth with reduced leaf size and chlorosis of foliage or wilting and root galls affected plants which are presented in Plate 1. Further, the study Samples comprising of both soil and root parts were collected with Random sampling technique (Lawrence and McLean, 1999a) from rhizosphere of flower crops grown in field as well as polyhouses conditions. For extraction of nematodes from the soil, modified Cobb's sieving and Baermann funnel technique (Christie and Perry, 1951) was followed by using a series of sieves (250, 45and 37 µm pore size). Each soil sample was thoroughly mixed and 200cc of soil was drawn from the homogenous mixtures for processing and the plant parasitic nematode genera were identified in addition, physiological features, mature females were identified on the basis of female perineal patterns, morphology and enumerated using a stereo microscope.

Results and Discussion

The findings of the study reveals broad spectrum species of plant parasitic nematodes at different locations based agroclamatic situation which favours the growth of nematodes. It was interesting to note the different types of nematode species were screened and identified in the study districts.

The detailed explanations of results are explained as mentioned below. The occurrence and population density of plant-parasitic nematodes on commercial flower crops like *Chrysanthemum* cultivated under open/polyhouses. It revealed the presence of eight species *viz*., *Meloidogyne*, *Helicotylenchus*, *Tylenchulus*, *Xiphinema*, *Pratylenhus*, *Hemicyclophora*, *Hoplolaimus* and *Radopholus* which were commonly found in the roots of commercially cultivated *Chrysanthemum* flower crops (Table 1).

Table.1 Community analysis of plant parasitic nematodes associated with *Chrysanthemum* (per 200cc of soil)

Place	Name of nematodes	Frequency distribution	Total No. of nematodes	Absolute frequency distribution (%)	Absolute density	Prominence value
Belgaum						
Arabhavi						
5*	*Helicotylenchus*	4	360	80	180.00	16.10
	Hoplolaimus	2	220	40	110.00	6.96
	Pratylenchus	3	420	60	210.00	16.27
	Meloidogyne	4	380	80	190.00	16.99
	Xiphinema	2	180	40	90.00	5.69
Budigoppa						
5*	*Pratylenchus*	4	350	80	175.00	15.65
	Helicotylenchus	2	240	40	120.00	7.59
	Meloidogyne	3	360	60	180.00	13.94
	Tylenchulus	1	100	20	50.00	2.24
	Hemicyclophra	1	80	20	40.00	1.79
Ghataprabha						
3*	*Meloidogyne*	3	320	100	160.00	16.00
	Pratylenchus	3	420	100	210.00	21.00
	Xiphinema	2	220	66.67	110.00	8.98
	Radopholus	1	60	33.33	30.00	1.73
Dharwad						
Dharwad	*Rodopholus*	2	80	66.67	40.00	3.27
3*	*Meloidogyne*	3	280	100	140.00	14.00
	Pratylenchus	3	440	100	220.00	22.00
	Helicotylenchus	3	360	100	180.00	18.00
Saidapur						
3*	*Tylenchulus*	3	280	100	140.00	14.00
	Helicotylenchus	3	240	100	120.00	12.00
	Xiphinema	1	120	33.33	60.00	3.46
	Meloidogyne	2	160	66.67	80.00	6.53
Gadag						
Lakkundi	*Meloidogyne*	3	160	75	80.00	6.93
4*	*Tylenchulus*	4	80	100	40.00	4.00
	Pratylechus	4	220	100	110.00	11.00
	Xiphinema	2	120	50	60.00	4.24
	Helicotylenchus	3	200	75	100.00	8.66
	Rodhopholus	2	60	50	30.00	2.12
Sambapur						
2*	*Meloidogynne*	2	200	100	100.00	10.00
	Tylenchulus	2	100	100	50.00	5.00
	Pratylechus	2	160	100	80.00	8.00
Bagalkot						
Hallur						
2*	*Helicotylenchus*	1	40	50	20.00	1.41
	Pratylenhus	2	200	100	100.00	10.00
	Meloidogyne	2	600	100	300.00	30.00
Lokapur						
3*	*Meloidogyne*	3	240	100	120.00	12.00
	Helicotylenchus	3	140	100	70.00	7.00
	Xiphinema	1	35	33.33	17.50	1.01
	Pratylenhus	2	180	66.67	90.00	7.35

*number of collected samples

Plate.1 Visual symptoms of nematode infected plant (survey)

In Belgaum district, eight species of plant parasitic nematodes were encountered from 13 different locations were *Pratylenchus* and *Meloidogyne* sp. occurred more frequently with 60 to 100 per cent absolute frequency followed by *Helicotylenchus* (40 to 80 %).

Radopholus and *Hemicycliophora* were less frequently encountered in the samples with respective absolute frequencies of 33.33 (Ghataprabha) and 20.00 (Budigoppa) per cent. Based on prominence values, it can be noted that, in study areas species like *Pratylenchus* (21.00) was more prominent nematode associated with rhizosphere soil sample at Ghataprabha followed by *Meloidogyne* sp (16.99) at Arabhavi village in belgum district of northern Karnataka.

Similarly in Dharwad district, six species have been found (viz., *Meloidogyne*, *Pratylenchus*, *Helicotylenchus*, *Tylenchulus*, *Xiphinema* and *Radopholus*) out of six, *Pratylenchus*, *Helicotylenchus*, *Meloidogyne* and *Tylenchus* sp. were more frequent with 100 per cent distribution and abundant with absolute density of 220 (Dharwad), 180 (Dharwad), 140 (Dharwad) and 140 (Saidapur) respectively. While, *Radopholus* sp was found to be less frequent with coupled with absolute density (40) and is less predominant (3.27) (Table 1).

The findings also revealed that in case of gadag district, Six species of parasitic nematode were encountered *viz*., *Pratylenchus*, *Meloidogyne*, *Helicotylenchus*, *Tylenchulus*, *Xiphinema*, and *Radopholus* among which *Pratylenchus sp* had the 100 per cent frequency with highest absolute density (110) at Lakkundi, followed by *Meloidogyne* (100) at Sambapur and *Helicotylenchus* (100) at Lakkundi were the three major nematode found in the study area. Conversely, in case of Bagalkot district, four plant parasitic nematodes species were identified (*Meloidogyne*, *Pratylenchus*, *Helicotylenchus* and *Xiphinema*). *Meloidogyne* sp such as was noticed to be highest predominant highest frequency distribution (100 %) and absolute density (300). Whereas the lowest frequency distribution was found in case of *Xiphinema* sp accounting for only 33.33 % of various locations in Bagalkot district of northern Karanataka (Table 1).

The findings on plant parasitic nematode in commercial plant of *Chrysanthemum* was found more significant and also deciding factor for the better returns for farming community especially cultivated by small and marginal formers in northern Karnataka regions. The results convey to conclude that Among eight phytoparasitic nematode genera were found to be associated with

Chrysanthemum. The *Pratylenchus* sp. was widely spread and abundant, perhaps indicating it as the major plant parasitic nematode of *Chrysanthemum*. *Meloidogyne* sp. was the second most frequent and abundant nematode in a soil samples collected from different locations. These results are in conformation with Mohammad *et al.*, (2008) who reported that three species of *Pratylenchus* being present during their survey in *Chrysanthemum* crop followed by HyeRim *et al.*, (2006) who reported the occurrence of *Pratylenchus* sp. on *Chrysanthemum*. In conclusion, we understand the limitations of this study since the morphological identification of the speiecs of plant parasitic nematoses was not corroborated by molecular analysis. However, Total eight phytoparasitic nematode genera were found to be associated with *Chrysanthemum* crop. The *Pratylenchus* sp. was widely spread and abundant, followed by *Meloidogyne* and *Helicotylechus* sp.

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How to cite this article:

Nilambika, K. Sumangala, M.S. Kulkarni, K. Balaji and Anuradha, R.W. 2018. Locating Hotspots and Identification of Plant Parasitic Nematode Associated With *Chrysanthemum* in Karnataka, India. *Int.J.Curr.Microbiol.App.Sci.* 7(02): 2990-2994.
doi: https://doi.org/10.20546/ijcmas.2018.702.364