International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org ||Volume 7 Issue 2 Ver. V || February 2018 || PP. 57-60

Study of Phytonematode Population Density in Chilli in Rangareddy District, Telangana: 2011 - 2012.

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ABSTRACT: *Plant parasitic nematode population was studied in Chilli in Rangareddy district, Telangana state of India from 2011 to 2012. Chilli is economically very important and valuable crop cultivated throughout the world. India is world largest consumer and exporter of Chilli in the world. Seven important species of plant parasitic nematodes were identified in soil and root samples of Chilli. They are Meloidogyne, Pratylenchus, Rotylenchulus, Helicotylenchus, Hoplolaimus, Xiphinema and Trichodorus. In these, Ecto-parasitic nematodes are Trichodorus and Xiphinema. Semi-Endoparasites are Rotylenchulus, Hoplolaimus and Helicotylenchus.Endoparasites are Meloidogyne and Pratylenchus. These nematodes were identified genera level based on morphological characters and they were observed under Stereo and compound microscope with 10X magnification.Meloidogyne and Pratylenchus species shows highest population density where as Xiphinema and Trichodorus shows least population density during the years 2011 and 2012.*
KEYWORDS: *Chilli, Nematode, Meloidogyne, Population density, root*

Date of Submission: 14-02-2018 Date of acceptance: 03-03-2018

I. Introduction

Plant parasitic nematodes are minute round worms which live in soil and attack plants. They cause high economical losses in both large and small scale agriculture worldwide (Blaxter et al.1998; Kleine et al. 1998). All plant parasitic nematodes characteristically have a feeding apparatus known as a stylet. Phytonematodes feed on the content of living cells by inserting and sucking the fluid with their stylet (Hussey et al. 2012).The feeding activities of these nematodes usually result in stunting and unthrifty plant growth, reduced crop yields and occasionally, plant death (Seshadri; 1970).These feeding areas formed in vascular tissues disrupt the flow of water and nutrients from roots to shoots, resulting in poor plant growth (Holterman, *et al.*2009). Nutrient uptake hampered leading to reduced plant growth and yield (Netscher and Sikora 1990.The most economically important group of plant parasitic nematodes are the sedentary endoparasites cyst nematodes and root-knot nematodes (Sasser and Freckman 1986; Koenning *et al.*1999; Chitwood 2003). *Meloidogyne incognita* has often been reported as a damaging nematode pest of vegetable crops including recent work by these authors (Anwar and Mckenry, 2010). This survey was conducted to update the information of population density and frequency of nematodes in Chilli crop.

II. Materials And Methods

Sampling was done in Gandipet area of Rangareddy district in Telangana State in year wise from 2011 to 2012. The soil and root samples of Chilli crop was collected randomly in different parts of the field.Soil and Root samples should not collect in wet, dry conditions and should collect when the soil moisture is suitable. Sampleswere collected in a plastic bag with the help of garden trowel from several core or spades of soil to 8 cm depth around the affected area from the root zone where roots are most abundant,Nematodes must alive for the extraction procedure; the samples in polythene bag should not be exposed to the Sun light as the accumulated heat may kill the nematodes.

Soil and root samples were placed in separate labeled bags and sealed. Soil samples were stored in refrigerator at temperature of 10-15^0 C and root samples were stored at 4-5^0 C.There are many methods for extracting nematodes from soil and root samples. Some methods are more effective than others for specific types of nematodes. They are Baermann Funnel method (Baermann 1917;Hopper *at el.*2005)., Cobb Sieving method (Jenkins, 1964).and Direct method.After extraction nematodes were counted by using Stereo microscope and Compound microscope at 10X magnification.

III. Results

The statistical analysis was done by using SPSS software to find out the mean values of nematodes, where means were significantly different at the level of 0.05.In the Chilli 250 gm of soil and 15 gm of root samples were collected for observation and sampling was done in 2011 and 2012.

Absolute frequency was determined using the following formula

$$\text{Frequency of Occurrence} = \frac{\text{Number of samples containing genera}}{\text{Number of samples collected (60)}} \times 100$$

Frequency and population density of nematodes per 250 g of Soil sample of Chilli2011 - 2012

Year	Nematodes	Mean ± SD	% Frequency Occurrence
2011	*Meloidogyne*	50.50 ±1.291	84.17
	Pratylenchus	37.00±5.009	61.67
	Rotylenchulus	33.00±3.162	55.00
	Helicotylenchus	33.25±1.708	55.42
	Hoplolaimus	24.25±2.754	40.42
	Xiphinema	19.50±1.291	32.50
	Trichodorus	15.25±2.217	25.42

Table 1

Year	Nematodes	Mean ± SD	% Frequency Occurrence
2012	*Meloidogyne*	45.50±2.082	75.83
	Pratylenchus	34.50±3.109	57.50
	Rotylenchulus	28.25±1.708	47.08
	Helicotylenchus	24.75±3.775	41.25
	Hoplolaimus	23.75±1.708	39.58
	Xiphinema	17.75±1.500	29.58
	Trichodorus	16.50±1.291	27.50

Table 2

Average frequency and population density of nematodes in Soil sample of Chilli2011 - 2012

Year	Nematodes	Mean ±SD	% Frequency Occurrence
2011-2012	*Meloidogyne*	48.00±3.296	80.00
	Pratylenchus	35.75±4.113	59.58
	Rotylenchulus	30.62±3.202	51.04
	Helicotylenchus	29.00±3.966	48.33
	Hoplolaimus	24.00±3.284	40.00
	Xiphinema	18.62±2.191	31.04
	Trichodorus	15.87±2.630	26.46

Table 3

Number of average values taken for mean (N) = 4
Mean Density ± Standard Deviation of nematodes per 250 g of soil
Frequency of occurrence (%of samples in which species was found)
The mean difference is significant at the $P < 0.05$ level

Frequency and population density of nematodes per 15 g of Root sample of Chilli2011 – 2012

Year	Nematodes	Mean ±SD	% Frequency Occurrence
2011	*Meloidogyne*	45.00±3.651	75.00
	Pratylenchus	36.75±2.217	61.25
	Rotylenchulus	34.25±1.893	57.08
	Helicotylenchus	27.00±2.160	45.00
	Hoplolaimus	20.75±1.708	34.58
	Xiphinema	21.50±1.291	35.83
	Trichodorus	15.75±3.096	26.25

Table 4

Year	Nematodes	Mean ±SD	% Frequency Occurrence
2012	*Meloidogyne*	34.25±3.403	57.08
	Pratylenchus	32.75±2.754	54.58
	Rotylenchulus	23.25±2.217	38.75
	Helicotylenchus	22.50±2.082	37.50
	Hoplolaimus	20.50±1.291	34.17
	Xiphinema	16.50±2.082	27.50
	Trichodorus	12.50±2.646	20.83

Table 5

Average frequency and population density of nematodes in Root sample of Chilli2011 – 2012

Year	Nematodes	Mean ±SD	% Frequency Occurrence
2011-2012	*Meloidogyne*	39.62±4.897	66.04
	Pratylenchus	34.75±3.668	57.91
	Rotylenchulus	28.75±5.151	47.91
	Helicotylenchus	24.75±8.742	41.25
	Hoplolaimus	20.62±2.473	34.37
	Xiphinema	19.00±2.769	31.66
	Trichodorus	14.12±2.949	23.54

Table 6

Number of average values taken for mean (N) = 4
Mean Density ± Standard Deviation of nematodes per 15 g of root
Frequency of occurrence (%of samples in which species was found)
The mean difference is significant at the $P< 0.05$

The average mean population density per 250 g of soil sample of Chilli from 2011 – 2012 (Table 3), *Meloidogyne* was 48 with frequency 80 %, *Pratylenchus* was 35.75 with frequency 59.58 %, *Rotylenchulus* was 30.62 with frequency 51.04 %, *Helicotylenchus* was 29 with frequency 48.33 %, *Hoplolaimus* was 24 with frequency 40%, *Xiphinema* was 18.62 with frequency 31.04 % and *Trichodorus* was 15.87 with frequency 26.46 The average mean population density per 15 g of root sample of Chilli from year 2011-2012 (Table 6), *Meloidogyne* was 39.62 with frequency 66.04%, *Pratylenchus* was 34.75 with frequency 57.91%, *Rotylenchulus* was 28.75 with frequency 47.91%, *Helicotylenchus* was 24.75 with frequency 41.25%, *Hoplolaimus* was 20.62 with frequency 34.37%, *Xiphinema* was 19.00 with frequency 31.66% and *Trichodorus* was 14.12 with frequency 23.54%.

IV. Discussion

My study has revealed that Chilli crop was host to a diversity of plant parasitic nematodes in Gandipet area. A large number of plant parasitic nematodes were recorded in soil and root samples of these crops. The

findings of nematodes associated with Chilli crop, support the previous work done in other parts of the world (Mennan & Handoo,2006;Pattison *et al.*;2006).

The nematodes present in soil and root samples of Chilli in my studies were *Meloidogyne, Pratylenchus, Rotylenchulus, Helicotylenchus, Hoplolaimus, Xiphinema, and Trichodorus.*These nematodes feed on epidermal root tissues which lead to pruning of root hairs and damage to epidermal root tissues and can reduce the ability of roots to absorb water and nutrients from soil leading to poor growth (MCkenry *et al*.2010). The occurrence of these nematode genera has frequently been found in commercially grown vegetable crops (chilli, brinjal, tomato, cauliflower, cabbage, cucumber etc..) (Anwar and Mekenry, 2010).These plant parasitic nematodes infections were reported by earlier researches in various vegetable crops that are in our study (Bridge 1996). These findings correlate with various other studies with these crops (Mennan and Handoo 2006).

Meloidogyne species was the most common nematode in Vegetable crops (tomoto, brinjal, cabbage, chilli, cauliflower etc.) (Anwar & Mckenry, 2010;) (Davis *et al*; 2003;Maqbool *et al*.,1988) which was found in high population density and can be of serious economic importance.

V. Conclusion

In my study, 7 genera of plant parasitic nematodes were observed in Chilli, they were *Meloidogyne, Pratylenchus, Rotylenchulus, Helicotylenchus, Hoplolaimus, Xiphinema, and Trichodorus* It was observed that in soil and root samples of chilli during the year 2011-2012 *Meloidogyne* showsthehighest nematode population while Pratylenchuswas the second highest and *Trichodorus* show the least population density. Nematode population observed in these areas was above the threshold level which shows the need of controlling measures. Integrated nematode management (INM) is an economically viable and socially acceptable approach for crop protection.

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International Journal of Engineering Science Invention (IJESI) is UGC approved Journal with Sl. No. 3822, Journal no. 43302.

Dr.Sk.Zareena. "Study of Phytonematode Population Density in Chilli in Rangareddy District, Telangana: 2011 - 2012." International Journal of Engineering Science Invention (IJESI), vol. 07, no. 02, 2018, pp. 57–60.