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Research Article

ASSOCIATION OF PLANT PARASITIC NEMATODES WITH EGG PLANT (2013- 2014) IN RANGAREDDY DISTRICT, HYDERABAD, TELANGANA, INDIA

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ABSTRACT

In Telangana in my study during (2013 – 2014) nematodes identify the association of plant parasitic nematodes and to assess the losses on vegetables including egg plant (*Solanum melongena*) planted at major vegetable production areas of Rangareddy district. A fifty samples were collected from 20 locations scattered over the vegetable production area of Rangareddy. The results showed that 85% vegetables fields were infected by plant parasitic nematodes. The plant parasitic nematodes that were found infecting to vegetables, in order of decreasing frequency, were in the year 2013 *Meloidogyne sp* (71%) *Rotylenchulus sp* (64.1%) *Helicotylenchus sp* (44.5%) *Pratylenchus sp* (41%) *Hoplolaimus sp* (36%), *Heterodera sp* (32.5%), *Xiphinema sp* (26.5%). The frequency of plant parasitic nematode ranged from 0 to 85.0% with an average of 47.19%. Population densities of *Meloidogyne* sp. and *Rotylenchulus sp* were at potentially damaging levels in most of the vegetable crops We observed 32.5% yield losses on vegetables commercially grown, which are higher compared to that of developed countries. Higher losses might be due to unawareness if grower about these plant parasitic nematodes.

INTRODUCTION

Nematodes are microscopic round worms found in many habitats and the most abundant organisms in soil on earth. Most are beneficial members of their ecosystems, but a few are economic parasites of plants and animals, landscape, garden and crop plants in world as well as in Telangana. Root Knot Nematodes (RKN), *Meloidogyne* spp. have become a major pest of vegetable crops impacting both the quantity and quality of marketable yields in the Punjab as a result of intensive agriculture (Mehrotra, 1983; Anwar *et al.*, 1992, 2007; Anwar and McKenry, 2010). Two most commonly pathogenic root knot nematode species found in the Punjab are *M. incognita* and *M. javanica.* Several plant parasitic nematodes can attack numerous plants including vegetables, fruits, field crops, ornamentals and common weeds (Anwar, 1989; Anwar *et al.*, 2009). RKN feeding results in cellular, metabolic and structural changes within plant cellsand tissues. These physiological and physical changes to the plant can reduce crop yield and quality (Anwar *et al.*, 2006).

In Telangana, vegetable crops are grown intensively for fresh market. The same sites are used to cultivate two to three crops due to mild winters and warm summers. It provides an opportunity of availability of many vegetable crops all the year round in one part of the country or another. In Telangana the various vegetables are grown on an area of ca 225-239,000 ha. The vegetable production has varied from 2,880.300-3,048,400 tons during 2005 (Anonymous, 2005).

Telangana produces a wide range of vegetables including brinjal, which have a great commercial demand due to their nutritive value. The average yield of vegetables in telangana is extremely low as compared to other vegetable growing countries of the world.

There can be several reasons for this low yield such as changing climatic conditions, primitive methods of cultivation, fungal, bacterial, viral and nematode diseases (Nagnathan, 1984; Jain, 1992). Among diseases, root knot nematode alone or in combination of other pathogenic organisms, is most destructive one and tremendously reduces both quantity and quality of vegetables (Roberts, 1987; Sikora and Fernandez, 1990; Abawi and Chen, 1998). Roots damaged by nematodes are unable to extract all of the available soil water and nutrients and lack of vigor leading to yield loss (Trudgill, 1992).

The plant-parasitic species cause estimated annual crop losses of $8 billion in the United States and $78 billion worldwide (Barker *et al,* 1998). Damage caused by plant parasitic nematode on 24 vegetable crops in USA was estimated to ca 11% (Feldmesser *et al.,* 1971). Nematodes cause severe damage to economically important vegetable crops. Estimatesof vegetable crop losses due to *M. incognita* and *M.*

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javanica have ranged from 17 to 20% for egg plant, (Kathy, 2000).

Eight genera of plant parasitic nematodes other than root knot have also been reported to be associated with vegetable crops. They include *Meloidogyne sp*, *Rotylenchulus sp, Pratylenchus sp, Helicotylenchus sp, Hoplolaimus sp, Heterodera sp, Trichodorus sp, Xiphinema sp.* (Safdar A. Anwar [1] and M.V. Mckenry[2].s 2012. Vol. 44(2), PP 327-333).

During my study several vegetable crops include eggplant, were found to be infected with root-knot nematodes and others (Anwar *et al.,* 2007). Nevertheless, the information on the losses inflected by these nematodes on vegetable crops is lacking in Thelangana. Consequently, the objectives of this were to (1) determine the identity, frequency, and population density of plant-parasitic nematodes with vegetable crops in the vegetable production area of Rangareddy and (2) assess the losses caused by root feeding nematodes, a major threat to vegetable production.

The data on association of *M. incognita* with vegetable growing area is limited (Khan *et al*., 2006).

MATERIALS AND METHODS

Sampling sites during (2013-2014) Nagole and Lal Bahadur nagar areas of Rangareddy district.

The samples were protected from temperature and light so as not to deteriorate the sample material and put in to the polythene bags separately. Fifty samples from all selected sites were brought to laboratory (Nematology laboratory Department of zoology, Osmania University, Hyderabad Telangana, India) for processing.

Processing of soil and root samples, Soil samples: A 100-cc of composite sample was processed through a 325-mesh sieve (pore size = 17 µm) followed by Modified Baermann-Funnel extraction to collect nematodes by using stereo and compound microscops under 10x magnification (Siddiqi 2000 and Luc *et al*., 1990).

Baermann funnel method

The basic requirement for the Baermann funnel method is a funnel with a piece of rubber tube attached to a small glass tube and closed with a clip or clamp. The funnel is mounted on a support with a 5-cm rubber tubing attached to the end of the funnel stem. A molded stainless steel wire basket is placed in the funnel and a pinch clamp on the rubber tubing below the funnel stem. The funnel is filled nearly to the top with fresh tap water. The inside of the wire basket is covered with a double layer of tissue paper. The material for extraction (soil, small pieces of plant roots, or organic material) is placed carefully on the tissue paper in the wire basket.

Figure .1

Brinjal field

Figure .2

Figure .3

Collection of the samples

Collection of soil and root samples in eggplant fields. Root and soil samples were collected by using an Random method. 18 cm deep root and soil samples around the plant rhizosphere and composite samples were made of 20 core samples per composite sample collected from each field. Different number of samples of root and soil were taken from each sampling site.

Within 24 h, active nematodes pass through the tissue paper and settle at the base of the funnel stem.

A Petri dish or vial is held below the end of the rubber tubing and the pinch clamp is opened to collect about 10 ml of water containing nematodes. A major disadvantage of this method is poor oxygenation, particularly at the base of the glass tube where nematodes settle. The modified version of this method includes replacement of the funnel by a tray. A thin layer of soil is placed on a wire mesh in the tray containing water. This requires little labor and uses relatively simple equipment. The nematodes are recovered after 24-48 h depending upon ambient temperature (25-30°C). After 24h the sample was collected for observation of nematodes under the Microscope. **(Oostenbrink, M.1960).**

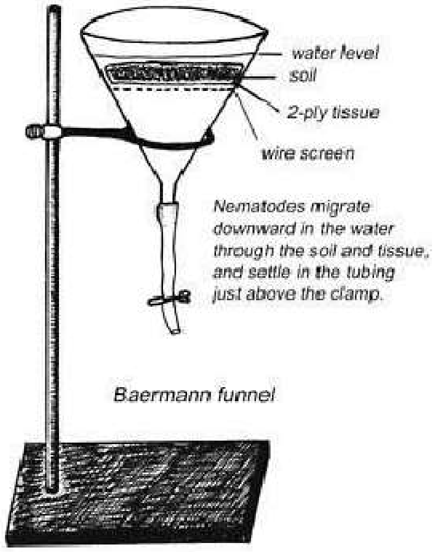

Figure .4

RESULTS

In my study the nematodes *species* identified were *Meloidogyne, Rotylenchulus, Helicotylenchus, Pratylenchus, Hoplolaimus, Heterodera, and Xiphinema* and these provided quantitative information on the frequencies and population densities. (Table 1&2).

Statistical Analysis

The statistical Analysis was done by using a software package "spss20". Multiple Comparison (Between years) was done by "Post Hock Tests". Mean nematodes densities were compared using Analysis of Variance (ANOVA). Means that were significantly different (P ≤ 0.05). Were separated by LSD. Absolute frequency was determined using the following formula.

$$\text{Frequency of Occurence} = \frac{\text{Number of samples containing genera}}{\text{Number of samples collected (50)}} \times 100.$$

Table 1 Frequency and population densities of plant parasitic nematodes in brinjal crops 200 g of soil samples for the year (2013 – 2014)

year	Phytonematodes	Mean ± SD	% Frequency Occurence
	Meloidogyne	39.50±1.291	79
	Rotylenchulus	33.25±1.708	66.5
	Helicotylenchus	26.50±2.646	53
2011	*Pratylenchus*	18.50±4.435	37
	Hoplolaimus	20.00±.816	40
	Heterodera	15.50±2.082	31
	Xiphinema	11.75±1.708	23.5

Table 2 Frequency and population densities of plant parasitic nematodes in brinjal crops 200 g of soil samples for the year (2013 – 2014)

year	Phytonematodes	Mean ± SD	% Frequency Occurence
	Meloidogyne	36.50±2.517	73
	Rotylenchulus	31.75±2.217	63.5
	Helicotylenchus	27.25±5.123	54.5
2013	*Pratylenchus*	19.75±3.304	39.5
	Hoplolaimus	15.75±4.031	31.5
	Heterodera	17.25±1.708	34.5
	Xiphinema	12.75±2.217	25.5

The data are the mean ± SD (***n=4***).
The multiple comararission (between years) was done by Post Hock test
*Statistically significant from other Phytonematodes (analyzed by ANOVA: ***p≤0. 05***).
Frequency of occurrence (% of samples in which species was found).

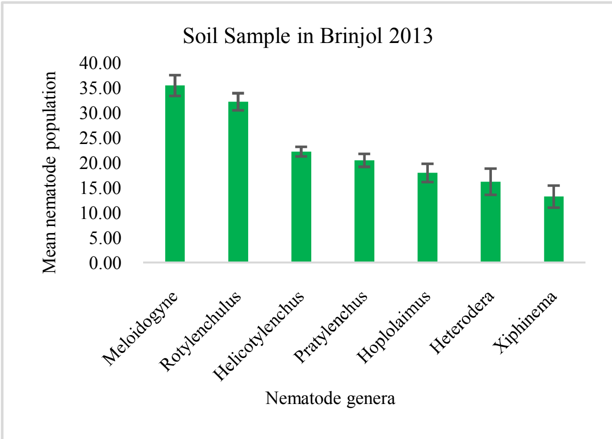

Figure 1

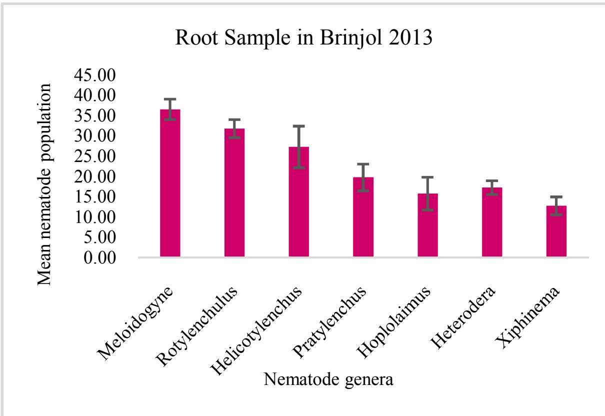

Figure 2

In Table .1. In brinjal crops the soil sample for the year 2013-2014

In the year 2013 Meloidogyne was 35.50±2.082, with frequency 71%, Rotylenchulus 32.25±1.708, with frequency 64.1%, Helicotylenchus 22.25±.957, with frequency 44.5%, Pratylenchus 20.50±1.291, with frequency 41%, Hoplolaimus 18.00±1.826, with frequency36%, Heterodera 16.25±2.630, with frequency 32.5%, Xiphinema 13.25±2.217 with frequency 26.5%.

In Table .2. In brinjal crops the root sample for the year 2013-2014

In the year 2013; the Meloidogyne was 36.50±2.517 with frequency 73%, Rotylenchulus 31.75±2.217 with frequency 63.5%, Helicotylenchus 27.25±5.123 with frequency 54.5%, Pratylenchus 19.75±3.304 with frequency 39.5%, Hoplolaimus 15.75±4.031 with frequency 31.5%, Heterodera 17.25±1.708 with frequency 34.5%, Xiphinema 12.75±2.217 with frequency 25.5%.

DISCUSSION

In my study has identified seven (7) different nematode genera on the Brinjal crops during the year (2013 – 2014). Biological diversity is comparable to the seven genera (7) found on the brinjal in the Nagole and Lal Bahadur nagar areas of Rangareddy district. However it is relatively low compared to the 13 genera of parasitic nematodes found on vegetable crops in during the dry season by Zakari (2008). This difference can be as a result of the climatic conditions (temperature, humidity) which act both on the development of the nematodes and vegetable crops. In addition to the low biodiversity, parasitic nematodes encountered werenot abundant. This result is not consistent with the finding of Haougui (1999) whoreported several nematodes both frequent and abundant in the same area. In the case of Meloidogyne, this low density in the rhizosphere of the brinjal crops could be explained by the fact that egg laid at the end of the dry season, enter in diapauses (Prot, 1984) and become brown to withstand adverse environmental conditions. The hatching of the eggs takes place only during the cold dry season when susceptible crops are planted. Furthermore the same author reported that at the end of the dry season, the second juvenile stage that are not yet established in the host roots, emerge as soon as the physiology of the roots changes and migrate up to 70 cm deep in the soil to escape the adverse climate conditions. They only go back when environmental conditions return to normal (presence of susceptible plant and acceptable temperatures). (Haougui *et* kollo 2006) showed that Meloidogyne can cause more than 60% yield loss. They reported that in heavy infested soil, they can lead to total tomato yield loss. Nematode biodiversity is relatively low in rhizosphere of the three crops (tomato, eggplant, pepper) but it is the characteristics of tropical and subtropical areas where most plant are attacked simultaneously by several species of nematodes.The existence of Multi- species communities in these areas can be explained by the agronomic, floristic and pedoclimatic diversity (International journal of agriculture and Crop Sciences 2012). *Meloidogyne* sp is the only species found in the roots of all the three crops, this phenomenon is reminiscent of the nematode situation in temperate zones. In these areas, the plants are usually attacked by one dominant species (Cadet *et al*., 1994).

The community structure of nematodes on pepper is dangerous for eggplant and pepper with the simultaneous presence of sedentary endoparasite (*Meloidogyne*) and migratory endoparasite *(Pratylenchus),* although the latter were not found in the roots. Endoparasites such as *Meloidogyne* and *Pratylenchus* can inhibit the proliferation of ectoparasites such as *Xiphinema* and rapidly colonize the plant whose potential would be drastically affected. Interspecific competition may also influence the structure of nematode populations (Pernilla *et al*., 2004). Sarr and prot (1985) showed a competition between species of the same genus as that between *Meloidogyne incognita* and *Meloidogyne javanica* on fonio (digitaria exilis).

The high population densities due to several reasons that includes Climatic changes, well temperature, sufficient rain fall, in my field there is no crop rotation so the nematode population was increased. When temperature was high the nematode population decreased. The high population densities show the need for research aimed at the management of plant-parasitic nematodes of tomato crop in Nagole and Lal Bahadur Nagar, Rangareddy District.

In my study plant parasitic nematodes had been detected in each year but with varying frequencies and densities. The nematode population had been fluctuating from year to year was due to various environmental factors, usage of organic manures in the soil and pesticides applied on these crops.

CONCLUSION

We extracted and identified the different phytonematodes in soil samples and root sample of brinjal crops of Nagole and LB Nagar region of Rangareddy district, Telangana. The nematodes identified were *Meloidogyne*sp. Rotylenchulussp *Pratylenchus sp. Helicotylenchus sp. Hoplolaimus sp. Heterodera sp. Xiphinema sp.* in the soil samples and root samples of brinjal crops. *Meloidogynespp, Rotylenchulusspp, Pratylenchusspp,* are significantly more in their number was calculated inbrinjal crop of soil samples and root sample as compared with other nematodes.

brinjal crops are economically important worldwide especially in India. The economic importance of the reported suspected nematode pest in brinjal crops with an aim of designing a proper nematode management strategy. This study provides important background information for planning and administering nematode management strategies in Nagole and LB Nagar region of Ranga reddy district. Telangana.

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