Bulletin of Pure and Applied Sciences
Vol.39A (Zoology), No.2,
July -December 2020: P.484-487
Original Research Paper

Print version ISSN 0970 0765
Online version ISSN 2320 3188
DOI 10.5958/2320-3188.2020.00056.X
Available online at www.bpasjournals.com

Survey and Identification of Root-Knot Nematodes in Selected Vegetable Crops in Telangana

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Received on 24.05.2020
Accepted on 16.11.2020

Abstract:
A survey was conducted over a period of one year to estimate the occurrence of root-knot nematode disease on vegetable crops in six selected villages of Sangareddy district of Telangana. This survey indicates that vegetable crops grown in the selected localities were heavily infested with root-knot nematodes. Highest frequency of disease occurrence in which almost all the roots have knot-like appearance was reported and also soil sampling revealed that crop showed the significant presence of Meloidogyne species as a pathogen identified in the vegetable crops. In all the cropping regions, prominent disease symptoms were developed as gall formation in the root region and poor plant growth resulting major crop yield loss to the farmers.

Keywords: Root knot nematode, Sangareddy, Meloidogyne species, Gall formation.

INTRODUCTION

Root-knot nematode, Meloidogyne species is an important group of plant-parasitic nematode. Meloidogyne is an endo-parasitic nematode dwells in almost all crops worldwide. These were recognized as a major constraint in vegetable crop and it causing high yield losses with heavily infested plant parasitic nematodes and constitute the major pest crop all over the World. [Atkins et al., 2003, Perry et al., 2009]

Root-Knot nematodes are sedentary endoparasites (Crow, W.T. & Dunn, R.A 2009). These nematodes parasitise a wide variety of crops amounting to more than 2000 plant species most of which are higher plants (Karsen & Meons, 2006; Moens et al., 2009).

Root knot nematodes complete several generations in one cropping season and interfere with water and nutrient uptake by the host plant. The purpose of this study was to estimate the distribution of root-knot nematodes problem faced on the cropping pattern. These phytopathogenic nematodes distribution differs from place to place and so research has been carried to reveal the species diversity of these nematodes. Recently John Sudheer et al., 2007 have studied the biodiversity of plant-parasitic nematodes in selected districts of Andhra Pradesh.

METHODOLOGY

For this study, a field survey was conducted in six selected villages of Sangareddy district in Telangana state to access the damage caused by the nematodes. Soil samples were collected from surveyed villages randomly from the fields. Soil sampling is done in the rhizosphere region at a depth of 10-20c.m and collected samples were stored at 10-15°C to avoid the decay and drying of specimens

and Roots of the vegetable plants were collected in polythene bags and neatly labeled. These were then brought to laboratory for examination. Upon arrival in laboratory, Soil samples were processed by Cobb's sieving and Decanting Method followed by modified Biermann's funnel Method (cobb, 1918). These nematodes obtained were fixed in 4% formalin and stored in a glass vials.

The no. of samples positive to the nematode infection and % of infection is calculated. Nematodes were counted genera wise and absolute and relative frequencies were calculated according to Nortan (1978). Plant-parasitic nematodes can be easily differentiated from free-living saprophytic nematodes with the presence of stylet in the head region. The nematode identification was mainly based on the morphology of adults and second stage juveniles (j2) (Eisenback, 1985). The fixed specimens were identified by making temporary mounts.

Root samples were examined for overall root structure following the infection, presence of galls on roots. Numbers of gall in each root were counted. In order to count the number of egg masses on root surface, roots were washed clean in running tap water for 10-15 minutes, these were then immersed in aqueous solution of acid fuschin (875 ml of lactic acid, 63 ml glycerol, 62 ml of water and 0.1gm of acid fuschin) for 30 minutes and then washed with tap water to examine the stained egg masses. Initially number of egg masses in each root were counted, gall index 1 was on a scale of 0 to 5 (Taylor and Sasser, 1978), where 0 = no galls; 1 = 1 to 2; 2 = 3 to 10; 3 = 11 to 30; 4 = 31 to 100; and 5 = more than 100 galls.

RESULTS

Root knot nematodes were recorded in all the surveyed villages such as Ameenpur, Ilapur, Kistareddipet, Kothapalle, Lakshmapur and Sulthanpur of Sangareddy district associated with the crops such as Tomato, Brinjal, Chilli, Ladies finger and Indian Bean. This study finds that the soil type has profound effect on the nematode reproduction facing greatest in coarsely textured sandy loam soils and least in more finely textured soils. The soil of Sangareddy District are mostly Red soil and Black-cotton soils with sandy loam textured. Therefore, soil type, moisture and temperature enhance the degree of Root knot nematode infestation and population size and Root sampled in selected location had significant amount of infection. Based on the observations made during the survey it can be concluded that the incidence of the root-knot nematode infection was above 75% on selected sites.

Figure 1: Bean root exhibiting Galls

Figure 2: Nematodes damage in Tomato root.

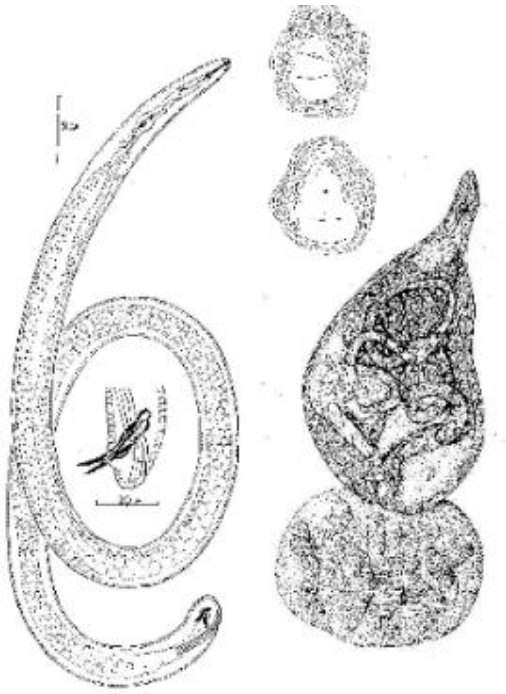

Figure 3: Meloidogyne species

Table 1: Showing the samples collected in selected crops and % of root knot infected soil of Sangareddy District.

Crops	Number of Samples collected	Samples +ve for Root Knot Nematode	Percentage of Root Knot Nematode Infested Soils
Tomato	10	09	90
Brinjal	10	07	70
Chilli	10	08	80
Ladies finger	10	07	70
Indian Bean	10	09	90
Total	50	40	-

Table 2: Frequency of root knot nematode on each crop plants in selected experimental fields

Crops	Number of plants observed	Galling Index	Average number of knot per plant	Plant physiognomy
Tomato	100	3	30	Stunted
Brinjal	100	2	10	Healthy looking
Chilli	100	3	30	Yellowish
Ladies finger	100	2	10	Healthy looking
Indian Bean	100	4	40	Stunted, Yellowish

DISCUSSION

This study has revealed that nematodes are abundant in sandy loam soils harbouring larger populations of plant-parasitic nematodes than clay soil where there is more aeration and easy movement. The penetrating capacity of nematodes was more in sandy loam soils. (Nadakal. A.M,

1966). Increase in nematode numbers could be due to multiplication of the nematode as a result of continuous presence of susceptible crops (Kratochil *et al*., 2004). Loss of plant growth vigour coupled with competition among the nematodes for limited reserves could explain the decline (Akhtar and Malik, 2000).

The intensity of Root knot nematode damage increased with the increase in the age of the plant. Extensive root galling was observed in Tomato, Bean cultivation in our survey. Highest population of female egg masses were observed inside and outside the galls as shown in figures 1 and 2.

CONCLUSION

Results of this study indicates that selected vegetable crop is very susceptible to root knot nematode infection as seen in Table 1, wherever the soil samples collected in selected crops are very susceptible to root knot nematode infection as seen in table 2: The galling index indicates that the extent of damage is really a serious problem for crops growers, while dissecting the knots from these crop plants, we found that there are more than two nematode females in each of the knot. Pathogenicity studies are required to quantify damages caused by individual nematode genera. There is need for continued research in order to come up with cheap yet effective nematode management techniques. This may include screening various cultivars for resistance to various plant parasitic nematodes (PPN) with an aim of designing a proper nematode management strategy and promotes the plants to with stand unfavorable condition with better exploitation of nutrients and moisture.

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