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ORIGINAL ARTICLE

COLLECTION AND POPULATION FREQUENCY OF PHYTO-PARASITIC NEMATODES ASSOCIATED WITH BRINJAL (*Solanum melongena*) IN NORTH UTTAR PRADESH REGIONS: A FIELD STUDY

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ABSTRACT: A survey was conducted to determine the types, frequency and population of plant parasitic nematodes associated with the soils and roots of Brinjal (*Solanum melongena*) in various Agra regions (e.g. Etmadpur, Sewla, Kheragarh, Samshabad) using random sampling for soil and root and using pie pan modification of Baerman funnel methods for plant parasitic nematode extraction. Plant-parasitic nematodes recovered included *Meloidogyne* spp., *Pratylenchus* spp., *Radopholus* spp., *Trichodorus* spp., *Rotylenchus* spp., *Helicotylenchus* spp. and *Rotylenchulus* spp. Seven genera of plant parasitic nematodes were encountered in Agra; while six genera in Etah and Mathura of U.P. respectively.
KEYWORDS: Phyto-Parasitic Nematodes, Frequency Distribution.

INTRODUCTION

In India nematodes are reported to cause about 10-40 %yield loss in Brinjal. However, losses may become still higher if nematodes are associated with other biotic and abiotic stresses in the field. Plant-parasitic nematodes are soil inhabiting, microscopic roundworms that feed on plant roots. Nematode feeding disturbs the water and nutrient absorption machinery in the root system, which in turn results in stunted growth, chlorosis and wilting of plants even in the presence of optimum moisture and nutrients in the soil. Being obligate parasites, nematodes do not kill their hosts instantly, but debilitate the host gradually without producing any specific above-ground symptoms. Therefore, nematodes are often referred as 'hidden enemies of the farmers'(SBI, 2004; Unny and Jerath, 1965). It should be noted that in the field it is common for multiple nematode genera to cause damage in the same field. Therefore, a mixture of root symptoms may occur together on the same plants. Plant-parasitic nematodes damage is an important factor in tuber quality reduction and yield loss in Brinjal in the field and in storage (Spaull and Cadet, 1990). However, plant parasitic nematodes associated with Brinjal in U.P., particularly in Agra, Etah and Mathura regions investigated. This survey was conducted to update available information on nematodes of Brinjal in U.P. region and determine the types, population levels and frequency of occurrence of plant parasitic nematodes associated with Brinjal in the three districts.

MATERIALS AND METHODS

The survey was carried out of Local areas of Agra between February to January and June 2008. In each of the Local Areas, agricultural field in three towns were randomly selected for sampling making a total of 60, 60 and 60 fields sampled in Agra, Etah and Mathura districts respectively. 10 plants were randomly selected for sampling. Soil samples were collected to a depth of 15-30cm with garden trowels. Samples (soil and root) from each farm were pooled and sealed in plastic bags and protected from the sun (Ricka and Barker, 1992). The samples were properly labeled and taken to Parasitology Laboratory of Gov. P. G. College, Etah for analysis and for identification of plant parasitic nematodes. Plant parasitic nematodes were extracted from the soil using the pie-pan modification of the Baerman Funnel method (Southey, 1986). Each composite soil samples was mixed thoroughly and plant parasitic nematodes were extracted from 200ml sub-sample. The set up was left undisturbed for 24 h before decanting the suspension into a beaker. Ten extraction trays were set up per sample. Plant parasitic nematodes in each suspension were killed by adding an equal volume of hot water to the nematodes suspension and each sample was then adjusted to a desired volume. The suspension was thoroughly mixed using a magnetic stirrer and 5ml aliquot was drawn from each suspension into a Doncaster counting dish for identification and quantification of the

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extracted nematodes. Temporary mounts of nematodes were prepared prior to nematode identification. Identification of plant parasitic nematodes to the generic level was done using the Lucid-key of Bell, (2004). Percentage frequency was determined using the formula n/N x 100. Where n = the number of times an individual nematode occurred in all the samples and N is the sample size (60 for each Agra, Etah and Mathura districts).

RESULTS

Five genera of plant parasitic nematodes were encountered in soil and root samples collected from Agra regions of U.P. State respectively. In the soil, plant parasitic nematodes identified were *Pratylenchus* spp., *Meloidogyne* spp., *Rotylenchus* spp., *Trichodorus* spp., *Rotylenchulus* spp. *Rotylenchulus* species was the most frequently occurring species in the soil (75%) where the population was 15500/200 ml soil which was followed by *Meloidogyne* species with 58.3% frequency rating and a population of 11542/200 ml soil while *Pratylenchus* species had frequency rating of 41.6% and a population of 6650/200 ml soil; while *Rotylenchus* species had the lowest population of 1750/ 200 ml soil (Table 1).

Table 1: Plant Parasitic Nematodes extracted from soils around the roots of Brinjal in AGRA

Nematode Genera	Frequency of Occurrence	% Frequency Rating*	Nematode Population/200 ml soil
Rotylenchulus spp.	45	75	15500 ± 175.6
Meloidogyne spp.	34	58.3	11542 ± 160.8
Pratylenchus spp.	25	41.6	6650 ± 147.2
Trichodorus spp.	15	25	3250 ± 126.9
Rotylenchus spp.	12	20	1750 ± 98.0

* n/ N x 100 (n) = number of times individual nematodes occurred and N = Sample size (60).

In the root sample similar trends were observed in which *Rotylenchulus* spp was the most frequently encountered species (70%) and a population of 8500/10g root, followed by Meloidogyne species with 56.6% frequency ratings and a population of 7300/10g root respectively (Table 2).

Table 2: Plant Parasitic Nematodes extracted from the roots of Brinjal in AGRA

Nematode Genera	Frequency of Occurrence	% Frequency Rating*	Nematode Population/10g root
Rotylenchulus spp.	42	75	8500 ± 350.5
Meloidogyne spp.	34	60	7300 ± 286.5
Pratylenchus spp.	20	60	6800 ± 270.8
Trichodorus spp.	15	25	2400 ± 106.9
Rotylenchus spp.	12	20	1250 ± 98.0

* n/ N x 100 (n) = number of times individual nematodes occurred and N = Sample size (60).

Six genera of plant parasitic nematodes were encountered in soil and root samples collected from Etah region of U.P. State respectively. In the soil, plant parasitic nematodes identified were *Meloidogyne* spp., *Pratylenchus* spp., *Trichodorus* spp., *Radopholus* spp., *Rotylenchulus* spp and *Rotylenchus* spp. *Meloidogyne* spp was the most frequently occurring species in the soil (63.3%) where the population was 17655/200 ml soil which was followed by *Pratylenchus* spp with 58.3% frequency rating and a population of 13887/200 ml soil; while the third frequently occurring species was *Rotylenchulus* with frequency rating of 50% and a population of 8345/200 ml soil. *Radopholus* spp had the lowest population of 2320/200 ml soil (Table 3).

Table 3: Plant Parasitic Nematodes extracted from the soil around the roots of Brinjal in Etah

Nematode Genera	Frequency of Occurrence	% Frequency Rating*	Nematode Population/200 ml soil
Meloidogyne spp.	38	63.3	17655 ± 217.3
Pratylenchus spp.	35	58.3	13887 ± 199.5
Rotylenchulus spp.	30	50	8345 ± 167.09
Trichodorus spp	25	41.6	5867 ± 98.3
Radopholus spp.	20	33.3	3780 ± 96.9
*Rotylenchus*spp.	15	25	2320 ± 62.8

* n/ N x 100 (n) = number of times individual nematodes occurred and N = Sample size (60).

In the root, similar trends were observed in which Meloidogyne spp was the most frequently encountered species (66.6%) and a population of 13000/10 g root, followed by *Pratylenchus* and *Rotylenchus* species with frequency ratings of 56.6 and 50.6% respectively (Table 4).

Table 4: Plant Parasitic Nematodes extracted from the roots of Brinjal in Etah

Nematode Genera	Frequency of Occurrence	% Frequency Rating*	Nematode Population/10g root
Meloidogyne spp	40	66.6	13000 ± 168.85
Pratylenchus spp.	34	65	10350 ± 156.35
Rotylenchulus spp.	28	50	8765 ± 162.8
Trichodorus spp.	20	33.3	5480 ± 85.6
Radopholus spp.	15	25	3500 ± 65.7
Rotylenchus spp.	12	20	1845 ± 22.0

* n/ N x 100 (n) = number of times individual nematodes occurred and N = Sample size (60).

Six genera of plant parasitic nematodes were encountered in soil and root samples collected from Mathura of U.P. State respectively. In the soil, plant parasitic nematodes identified were *Rotylenchulus* spp., *Meloidogyne* spp., *Pratylenchus* spp., *Trichodorus* spp., *Radopholus* spp., and *Rotylenchus* spp. *Rotylenchulus* spp was the most frequently occurring species in the soil (71.6%) with a population of 16500/ 200 ml soil which was followed *Meloidogyne* spp. with 63.3% frequency rating and a population of 17555/200 ml soil while the third frequently occurring species was *Pratylenchus* spp with frequency rating of 50% and a population of 11835/200 ml soil. *Trichodorous* spp and *Radopholus* spp had the lowest frequency rating of 16.3% and 13.3% with populations of 2480/200 ml soil and 1234/200 ml soil respectively (Table 5).

Table 5: Plant Parasitic Nematodes extracted from the soil around the roots of Brinjal in Mathura

Nematode Genera	Frequency of Occurrence	% Frequency Rating*	Nematode Population/200 ml soil
Rotylenchulus spp.	43	71.6	15500 ± 350.5
Meloidogyne spp.	38	63.3	14600 ± 276.5
Rotylenchus spp.	30	50	11835 ± 240.8
Pratylenchus spp.	26	43.3	8958 ± 66
Trichodorus spp.	10	16.6	2480 ± 84.8
Radopholus spp.	8	13.3	1200 ± 60.2

* n/ N x 100 (n) = number of times individual nematodes occurred and N = Sample size (60).

In the root, similar trends were observed in which *Rotylenchulus* spp was the most frequently encountered species (68.3%) and a population of 8507/10 g root, followed by *Meloidogyne* spp and *Pratylenchus* spp with frequency ratings of 56.6 and 50.6% respectively (Table 6).

Table 6: Plant Parasitic Nematodes extracted from the roots of Brinjal in Mathura

Nematode Genera	Frequency of Occurrence	% Frequency Rating*	Nematode Population/10g root
Rotylenchulus spp.	41	68.3	8507 ± 98.8
Meloidogyne spp.	34	56.6	8400 ± 101.4
Rotylenchus spp.	28	50.6	7125 ± 98.5
Pratylenchus spp.	20	33.3	5430±76.5
Trichodorus spp.	8	13.3	2100±56.2
Radopholus spp.	5	8.3	1098±45.9

* n/ N x 100 (n) = number of times individual nematodes occurred and N = Sample size (60).

DISCUSSION

The intensification of agriculture has led to continuous change and lack of stability in the ecosystem, making conditions favorable for certain species of plant parasitic nematodes while exerting immense selection pressure upon others (Wallace, 1971; Tiyagi *et al*., 1987). The sustainability of these intensified Brinjal based systems is threatened by build up of soil borne constraints, particularly plant parasitic nematodes. Plant parasitic nematodes have been reported to constitute serious impediments to Brinjal production in various parts of the world (Anwar *et al*., 1986). In the present investigation, *Meloidogyne* spp. (root-knot nematode), *Pratylenchus* spp. (lesion nematodes), and *Rotylenchulus* spp. (reniform nematode) were the most frequently occurring species in the soil and root sample. Of these, lesion nematode *Pratylenchus* spp., is the most predominant and economically important genus. This nematode is widely prevalent in both subtropical and tropical regions and reduces yield and quality of cane in both light and heavy soil types. Root-knot nematodes *Meloidogyne* spp. is a problem mainly in light sandy loam and sandy soils. The reniform nematode, *Rotylenchulus* spp., nematode causes root rotting and reduced uptake of water and soil nutrients. The symptoms are general lack of vigor, discoloration of foliage, and (or) stunted plants (Hall and Irey, 1992). Plant-parasitic nematodes damage is an important factor in tuber quality reduction and yield loss in Brinjals both in the

field and in storage. Brinjals are vulnerable to nematode damage as they reduce the yield and quality of the tubers as a result of root gallings, root lesions, dry and soft rots depending on the type of plant parasitic nematodes present. The presence of plant parasitic nematodes could constitute serious impediments to the growth and yield of Brinjals in Agra, Etah and Mathura regions of U.P. States.

However, the presence of nematode population density beyond the threshold level warrants initiation of immediate corrective measures. Ideally, such alternative approaches should not only be effective in suppressing nematode population but also offer other agronomic benefits about which farmers are already convinced. Otherwise, it would be difficult to get these approaches adopted by the farmers.

REFERENCES

Anwar SA, Kallu MA, Javid MA, Khan SH. Nematode parasites of Brinjal. J Agric Res 1986;24:124-126.

Bell M. Plant Parasitic Nematodes: Lucid\key to 30 Genera of Plant Parasitic Nematodes 2004. http://www.lucidcentral.com/keys /nematodes.

Hall DG, Irey MS. Population levels of plant-parasitic nematodes associated with Brinjal in Florida. Journal of the American Society of Sugar Cane Technologists 1992;12:38-46.

Ricka DA, Barker KR. Nematode Assays and Advisory Services. In: Nematology in the Southern Region of the United States. Riggs RD (Ed). South Cooperative Service Bulletin 276 Arkansas Agric. Exp. Fayetteville 1992.

SBI (Sugar Breeding Institute). Approaches integrated management in Brinjal. SBI Newsletter 2004;23(1):02-03.

Southey JF. Laboratory methods for work with plant and soil nematodes. Reference Book Ministry of Agriculture Fisheries and Food No. 402. London, Her Majesty's Stationery Office 1986;pp:202.

Spaull VG, Cadet P. Nematode parasites of Brinjal. In: Luc M, Sikora RA, Bridge J (Eds.). Plant parasitic nematodes in subtropical and tropical agriculture. CAB International, Oxon, UK 1990;pp:461-491.

Tiyagi SA, Bano M, Anver S. Populations build up of phytonematodes associated with pearl millet. Int Nematol Network Newslett 1987;4(4):19-20.

Unny KL, Jerath ML. Parasitic nematodes on Dioscorea spp. in Eastern Nigeria. Plant Dis Rep 1965;49:875-876.

Wallace HR. The influence of density of nematode populations on plants. Nematologica 1971;17:154–166.