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Vertical Distribution of Root Lesion Nematode (*Pratylenchus thornei*) under Chickpea- Maize Crop Rotation

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A B S T R A C T

Root lesion nematode; *Pratylenchus thornei* (Sher and Allen) is a migratory endoparasite commonly fed and reproduced in the cortical tissue of the host. Necrotic lesions are developed when they commonly severe infesting the host roots. To determine the their vertical distribution of in chickpea – maize crop rotation, the soil and root samples were collected from different levels of soil depth during *Rabi*-2016 and *Kharif*-2017. The size of sample was 1 kg/depth and replicated thrice. The samples were processed with Whitehead tray extraction method and *P. thornei* populations were examined. Distribution of *P. thornei* in chickpea field was enormous and they were between 4.5 to 30 cm of the soil depth with the encountered population ranging from 600 to 5000 N/200 cm^3 soil and 100 to 700 N/5 g root. The samples collected from rhizospheric soils of maize *kharif* were examined for their distribution pattern, was maximum (1000-1200 N/200 cm^3 soil) between 12 to 18 cm soil depth. However depth of 10 cm was encountered with ambient population of nematodes whereas 16 cm there was scarcity of the population. Simultaneously examination of the maize roots population around the maize was not sustained in any of the roots within different depth of soil.

Introduction

The *Pratylenchus thornei* have been reported one of the biotic stress which mainly rechangable for yield losses to the tube of 40 % in intolerant cereals and legumes in South Australia (Nicol, 1996). Reliable and right sampling for plant-parasitic nematodes is essential to determine relative densities of population correlated with the yield losses in presence of nematode density and which could help to reason assessment for management strategies. The sampling of vertical distribution of *P. thornei* will differ with existing conditions and unfavorable reason (Boag *et al.*, 1987; Boag *et al.*, 1992). Horizontal distribution of plant-parasitic nematodes is affected by the distribution pattern namely the root systems (Kimpinski and Welch, 1971), but also governed by edaphic factors nearly rhizosphere such as temperatures, soil types and pH (Wallace *et al.*, 1993; Sarah *et al.*, 1991). Vertical distribution of nematodes in soil confined with different nematode species (Davis *et al.*, 1994), distribution of the host's root systems (Mac Guidwin and Stanger 1991; Rawsthorne and Brodie, 1986) and the soil type which

differed environmental conditions (Ferris and Mc Kenry, 1974; Sohlenius and Sandor, 1987). Most of the studies during past suggested nematode densities in the top 15-20 cm soil profile and it appear to be the optimum sampling depth (McSorley and Dickson, 1990). In the black clay vertisols of the Queensland, the majority of RLN are presence between 15 and 60 cm but they can even present to the depths of 90 cm (Thompson, 1990). Another factor which may be considered while assessing sampling techniques provides distribution of nematode and their recovery. Mechanical disturbance during cultivation could reduce recovery of *Pratylenchus* spp. (McSorley and Gallaher, 1993) and soil sampling result disturbance similar to that of tillage. This effect is likely to be greatest when nematodes have survived within extended dry periods in a state of anhydrobiosis (Hinton, 1968). In the northern hemisphere, *P. thornei* has been reported frequently anhydrobiosis (Glazer and Orion 1983; Tobar *et al.,* 1996) whereas, in South Australia, high numbers of both *P. thornei* and *P. neglectus* recovered with great number in soil and coiled in dry cereal roots during summer. The aim of the studies was confirms the distribution of *P. thornei* in the different soil depth or their vertical density in chickpea- maize crop alternations.

Materials and Methods

Study sites were located in BISA Jabalpur (M.P.) and collected samples were transported to store before and assess of population in the Department of Plant Pathology, JNKVV, Jabalpur (M.P.). Soil samples were collected before cultivation and sowing of cereal or legume crops from June-July and October-November. Identification of *Pratylenchus* species was based on vulval position of: *P. thornei* V= 73-80% (Loaf, 1991) of the sample 200 cm^3 and 5 g roots were processed for the nematode extraction with Whitehead tray method (Whitehead and Hemming, 1965). Soil samples were collected with the help of soil auger sampler from the 4.5, 8, 12, 16, 20, and 30 cm depth of soil. Samples were taken after the harvest of the each crops viz. chickpea (March) and Maize (October).

Analysis

All data were analyses on the bases of distribution of nematodes at different depth were expressed as percentage of total nematode (McSorley and Dickson, 1990).

Results and Discussion

Vertical distribution

Data evidenced from Table 1 showed maximum and significant (P=0.05) nematode populations within 12-16 cm depth with the population of 5084 N/200 cm^3 soil depth in chickpea whereas between 8-12 cm encountered population 4045 N/ 200 cm^3 soil from chickpea; whereas from maize nematode populations was drastically reduced and the minimum populations were found in between 20-30 was 55.33 N/cm^3 soil. However population above threshold level of damage were predominant within 12-30 cm of soil depth in chickpea whereas 4-12 cm in maize.

Nematodes were recovered from the all the six soil depth during the investigation from both crops. The maximum (89.86 %) (Table 2) of nematodes population was recovered up to the 20 cm of the soil depth in chickpea cultivation whereas poor in the maize but it was maximum (91.76 %) up to 12 cm soil depth.

Reproduction factor

The maximum reproduction of *P. thornei* was at 8-12 and 12-16 cm depth was significantly increased the nematode population during chickpea (Table 3).

Table.1 Vertical distribution of *Pratylenchus thornei* in the six different soil profiles

Soil depth (cm)	Chickpea		Maize	
	Nematode population/5g root	Nematode population /200 cm^3 soil	Nematode population/ 5g root	Nematode population/200 cm^3 soil
0-4	101.67	616.33	-	346.33
4-8	215.00	1842.00	-	750.00
8-12	510.33	4045.00	-	1211.00
12-16	728.67	5084.00	-	86.67
16-20	115.00	3160.33	-	65.00
20-30	63.33	1790.00	-	55.33
CD at 5%	**79.374**	**398.254**	**-**	**51.682**

Table.2 Per cent distribution of nematode population in different six soil depth

Soil depth (cm)	Chickpea	Maize
	Percent Nematode Population	Percent Nematode Population
0-4	3.93	13.77
4-8	11.26	29.83
8-12	24.93	48.16
12-16	31.81	3.45
16-20	17.93	2.59
20-30	10.14	2.20

Significant at CD (0.05) level of significance

Table.3 Reproduction factor of *Pratylenchus thornei* in six different soil depth levels during chickpea

Soil Depth (Cm)	Initial Nematode Population (before sowing)	Final Nematode Population (after harvest)	Reproduction Factor (Pf/Pi)
0-4	264.67	718.00	2.71
4-8	450.00	2057.00	4.47
8-12	876.00	4555.33	5.20
12-16	1142.00	5812.67	5.08
16-20	1040.67	3275.33	3.15
20-22	646.67	1853.33	2.87

Nematode population were significant at CD= 5% level of significance

Maximum *Pratylenchus* spp. population was predominantly up to in the top 16 cm and was 89.86%. The deeper depth of soil, hold *Pratylenchus thornei* whereas quit low within a depth of 0-8 cm. Although higher nematodes levels in shallower soil layers are

consistent and high from deeper depth (McSorley, 1987; MacGuidwin and Stanger, 1991). In South Australian soils, vertical distribution of nematodes probably reflects root distribution as most plant root growth was concentrated in the upper 20 cm of the soil depth. In deep soil, *Pratylenchus thornei* were detected even at the greatest depth sampled (120 cm) as previously reported in Australia (Davis *et al.,* 1994). Most of the previous studies reported maximum nematode densities in the top 15-20 cm of the soil profile and this appears to be the most common sampling depth (McSorley and Dickson, 1990). The nematodes population was decreased when crop sequenced with the non host crop maize then chickpea accord with McSorley and Dickson (1990); Davis *et al.,* (1994) Barley is an effective rotation crop in *Pratylenchus*-infested soil due to its greater tolerance and resistance to *P. thornei* and *P. neglectus*. The reproduction factors with maximum population were noticed up to the 16 cm of the soil depth.

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