



Research Article

BIODIVERSITY OF PLANT PARASITIC NEMATODES ASSOCIATED WITH COTTON IN KHAMMAM DISTRICT OF ANDHRA PRADESH, INDIA

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ABSTRACT

Cotton (*Gossypium* spp) is one of the most important economical crops among the different economical crops in the agriculture and it is intensively cultivated in all over the parts of India especially in middle part of Andhra Pradesh, India. A total number of 51 each soil and root samples were collected from Various parts of Andhra Pradesh in Khammam, Sathupally, Wyr, Madhira, Palair constituency of Khammam District of Andhra Pradesh, India during August 2012 to November 2012. Covering a range of soil types such as clay (12), sandy loam (09), red soil (14), Black soil (16), were processed and nematodes populations were assessed. In the present study revealed that the all areas of root lesion nematodes (Reni form nematode) *Rotylenchus reniformis* was the predominant species found to occur in maximum number of root samples (33/51) and it has the highest prominence value of 1237.2, 1981.7, 1319.6, 2922.7 and 1981.0 (Table 1) with admiration to 5 constituency followed by root knot nematode (*Meloidogyne incoinitga*) and Lesion nematode (*Paratylenchus pratensis*) maximum percentage occurrence of *Rotylenchus reniformis* was recorded from red soil (89.00 %), black soil (63.00 %) clay (43.00 %) followed by sandy loam (34.00 %) (Table 3). Analysis of the soil sample revealed the presence of 08 genera of plant parasitic nematodes.

Keywords: Biodiversity, community, Nematodes, Gossypium spp, soil, Khammam District, Andhra Pradesh

INTRODUCTION

Cotton is one of the principal crops of India and plays a vital role in the country's economic growth by providing substantial employment and making significant contributions to export earnings. The cotton cultivation sector not only engages around 6 million farmers, but also involved another about 40 to 50 million people relating to cotton cultivation, cotton trade and its processing¹⁻⁴. Cotton is an important fiber yielding crop of global importance, which is grown in tropical and subtropical regions of more than 80 countries in the world over. Cotton refers to those species of the genus *Gossypium* which bear spinnable seed coat fibers. Cotton seed bears two types of fibers viz, long fibers known as lint which can be separated from the seed by the process of ginning; and short fibers known as fuzz or linters which remain on the seed even after ginning. The lint is used for spinning purpose⁵. Thus those species of *Gossypium* which possess lint that can be spun into fine yarn are referred to as cotton. Namely 09 species of plant parasitic nematodes have been reported in association with cotton root systems and are mainly responsible for controlling the cotton production to greater extent⁶. Keeping in view of the disturbing nature of this pest, the present study was undertaken to examine the biodiversity of plant parasitic nematodes associated with *Gossypium* grown in Khammam district of Andhra Pradesh, India⁷⁻¹². A. P. Stands 3rd rank in Cotton area in India with (10.22 lakh ha) next only Maharashtra (29.80 L. ha) and Gujarat (16.87 L. ha). The share in area of A. P. in India is 11.6 %. Out of this 10.22 L. ha area about 12 % is being grown under irrigated dry conditions. A. P¹⁴⁻¹⁶. Stands 3rd rank in Cotton production in India with 26.75 Lakh bales (Bale is 170 kg each) next only to Maharashtra (34.25 L.B) and Gujarat (32.50 L.B). The share of A.P in production in India is only 16.9 %.

MATERIAL AND METHODS

During the month of August 2012 to September 2012 an intensive survey of plant parasitic Nematodes affecting cotton plant was conducted from the cotton growing areas of Khammam, Wyr, Sathupalle, Madhira and Palair Constituencies of Khammam District, India. A total of 5 leach of soil and root samples were collected from different soil samples viz clay, sandy loam, red soil and black soil in and around the Khammam District of Andhra Pradesh, India. Survey work was conducted mainly from the cotton fields in different places of Khammam District. At each place a random of soil and root samples were collected from cotton plants at 25-50 cm away from the roots of the plant to a depth of 10-50 cm with the help of a G1 pipe diameter 75 mm. Collected samples were taken within the basin, mixed well and an aliquot 250 cc samples were drawn in addition to the root bits collected through auger, 10-20 g at tender, white to orange colored semi hard portion of the main roots wherever possible from the base of the plant. Number of sample collected from different moieties of cotton covering different soil types are net large and inform due to the non-availability of plants at the respective places. Soil samples more processed for nematode assay by decanting and sieving followed by the modified Baermann funnel technique¹⁷⁻¹⁸. The root sample more thoroughly washed in running tap water chopped and thoroughly mixed. Five grams of these composite samples were stained in acid fuchsine and lacto phenol method, and the nematode population in root was estimated by traction through maceration by using a kitchen blender. Nematodes collected from soil samples were killed in hot water and later fixed in 4 % formaldehyde solution. Nematode population as estimated by using a stereoscope microscope. Plant parasitic nematodes were identified up to genus/species level by using standard monograph. The species of root knot nematode were identified by their perennial pattern male and juvenile character. The Absolute

frequency, Absolute density and Prominence value of the nematodes calculated using methodology of⁶⁸ as given below.

$$\text{Absolute frequency} = \frac{\text{Number of samples containing nematodes}}{\text{Number of samples collected}} \times 100$$

$$\text{Absolute density} = \frac{\text{Number of nematodes in all samples}}{\text{Number of sample collected}} \times 100$$

$$\text{Prominence value} = \text{Absolute density} \times \sqrt{\text{Absolute frequency}}$$

Table 1: Community analysis of plant parasitic nematodes from 51 root samples of cotton grown in Khammam district, India

Samples collected (Area Name)	Name of the Nematodes	Frequency Distribution	Total no of Nematodes	Absolute Frequency Distribution	Absolute Density (%)	Prominence Value
Khammam (16)	<i>Melodogyne</i>	6	30	37.5	187.5	1147.5
	<i>Rotylenchus</i>	8	28	50	175	1237.2
	<i>Pratylenchus</i>	3	11	18.75	68.7	295.5
	<i>Haplolaimus</i>	4	16	25	100	500
	<i>Xiphenema</i>	1	9	6.25	56.2	140.5
	<i>Paratylenchus</i>	3	18	18.75	112.5	487.1
Wyra (13)	<i>Tylenchorhynchus</i>	1	7	6.25	43.7	109.2
	<i>Rotylenchus</i>	6	38	46.1	292.3	1981.7
	<i>Pratylenchus</i>	2	17	15.38	130	509.6
	<i>Meladogyne</i>	4	33	30.7	253	1401.6
	<i>Haplolaimus</i>	5	12	38.4	92.3	571.3
	<i>Tylenchorhynchus</i>	2	8	15.3	61.5	137.1
Sathupalle (7)	<i>Paratylenchus</i>	1	11	7.6	84.6	232.6
	<i>Meladogyne</i>	7	17	100	242.8	2428
	<i>Tylenchorhynchus</i>	2	6	28.5	85.7	456.7
	<i>Xiphenema</i>	1	3	14.2	42.8	160.9
	<i>Paratylenchus</i>	3	15	42.8	214.2	1400.8
	<i>Rotylenchus</i>	5	11	71.4	157.1	1319.6
Madhira (8)	<i>Haplolaimus</i>	3	17	42.8	242.8	1587.9
	<i>Rotylenchus</i>	6	27	75	337.5	2922.7
	<i>Meladogyne</i>	5	33	62.5	412.5	3258.7
	<i>Haplolaimus</i>	3	22	37.5	275	1683
	<i>Pratylenchus</i>	2	18	25	257	1283
	<i>Tylenchorhynchus</i>	1	7	12.5	87.5	288.7
Palair (6)	<i>Paratylenchus</i>	1	11	12.5	137.5	453.7
	<i>Rotylenchus</i>	3	17	50	283	1981
	<i>Haplolaimus</i>	2	8	33.3	133	758.1
	<i>Meladogyne</i>	3	22	50	366	2562
	<i>Paratylenchus</i>	1	13	16.6	216	879.12

Table 2: Community analysis of plant parasitic nematodes from 51 Soil samples of cotton grown in Khammam district, India

Samples collected Area Name	Name of the Nematodes	Frequency Distribution	Total no of Nematodes	Absolute Frequency Distribution	Absolute Density (%)	Prominence Value
Khammam (16)	<i>Melodogyne</i>	7	26	37.5	187.5	1147.5
	<i>Rotylenchus</i>	5	28	50	175	1237.2
	<i>Pratylenchus</i>	3	12	18.75	68.7	295.5
	<i>Haplolaimus</i>	2	22	25	100	500
	<i>Xiphenema</i>	1	12	6.25	56.2	140.5
	<i>Paratylenchus</i>	5	16	18.75	112.5	487.1
Madhira (14)	<i>Tylenchorhynchus</i>	1	7	6.25	43.7	109.2
	<i>Rotylenchus</i>	6	23	46.1	292.3	1981.7
	<i>Pratylenchus</i>	3	17	15.38	130	509.6
	<i>Meladogyne</i>	7	27	30.7	253	1401.6
	<i>Haplolaimus</i>	3	19	38.4	92.3	571.3
	<i>Tylenchorhynchus</i>	4	12	15.3	61.5	137.1
Wyra (7)	<i>Paratylenchus</i>	1	15	7.6	84.6	232.6
	<i>Meladogyne</i>	7	32	100	242.8	2428
	<i>Tylenchorhynchus</i>	2	13	28.5	85.7	456.7
	<i>Xiphenema</i>	1	09	14.2	42.8	160.9
	<i>Paratylenchus</i>	4	21	42.8	214.2	1400.8
	<i>Rotylenchus</i>	6	23	71.4	157.1	1319.6
Sathupalle (8)	<i>Haplolaimus</i>	2	19	42.8	242.8	1587.9
	<i>Rotylenchus</i>	7	38	75	337.5	2922.7
	<i>Meladogyne</i>	5	35	62.5	412.5	3258.7
	<i>Haplolaimus</i>	4	25	37.5	275	1683
	<i>Pratylenchus</i>	3	19	25	257	1283
	<i>Tylenchorhynchus</i>	2	13	12.5	87.5	288.7
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	<i>Rotylenchus</i>	6	19	50	283	1981
	<i>Haplolaimus</i>	2	12	33.3	133	758.1
	<i>Meladogyne</i>	4	27	50	366	2562
	<i>Paratylenchus</i>	2	17	16.6	216	879.12

RESULTS AND DISCUSSION

Community analysis of plant parasitic nematodes associated with cotton root showed that five constituencies. With various intensity of nematodes populations; The Root knot nematodes *Rotylenchus reniformis* was recorded from Khammam Exchanged of Sathupalle and Wyra of constituencies of Khammama. Present study revealed that the presence of genera of plant parasitic nematodes similar to soil samples maximum occurrence of *Reni formis* sp. population was recorded in soil samples all constituencies. Surveyed and had the highest prominence Values of 1237.2, 1981.7, 1319.6, 2922.7 and 1981.0 (Table 2) with respect to khammam, Sathupalle, Wyra, Madhira, and Palair respectively. Further prominence value was *Meladogyne incognata*, *Pratylenchus* spp, *Hoplolaimus* spp *Tylenchorhynchus* sp were recorded in minimum number and does not cause much damage to cotton fields. The maximum percentage of different nematodes was recorder from clay soil, sandy loam soil, red soil and black soil. Maximum percentage of *Rotylenchus* sp. was recorded from red soil 89 %, black soil 63 %, clay 48 % and sandy loam 34 %. The second highest percentage of occurrence was seen in the case

of *Meladogyne* spp by recording black soil 71 %, sandy loam soil 57 %, and clay 51 % and red soil 43 % (Table 3). For other species may be due to the minimum number of samples collected from thus two soil types. The widespread occurs of *Rotylenchus* spp was recorded in most of the areas surveyed and recovery of their higher number from Cotton in all five areas of Cotton suggests that the nematode plays a key role in limiting Cotton production. The survey result showed that in most of the Cotton plantation grown in their area exhibited standard growth and yellowing leaves accompanied by poor necrotic root system in those plantations where high population of plant parasitic nematodes were present. Among the nematodes maximum frequency density and prominence value was recorded in *Rotylenchue reniformis*, *Meladogne incognata*, *Pratylenchus* spp and *Tylenchaorhynchus* spp, *Hoplolaimus* spp Earlier report on the wide spread occur of *Meladogyne incognata*, *Rotylenchus reniformis*, and *Pratylenchus* spp in Cotton plantations supports the present findings. The root-lesion nematode *Rotylenchus reniformis* was the dominant species found to occur maximum in all the five areas of Cotton surveyed followed by *Meladogyne incognita* was recorded in all soil and root samples of Cotton.

Table 3: Percentage of Occurrence (%)

Soil Types	<i>Rotylenchus</i>	<i>Meladogyne</i>	<i>Haplolaimus</i>	<i>Pratylenchus</i>	<i>Tylenchorhynchus</i>
Clay (12)	48	51	37	81	12
Sandyloam (9)	34	57	33	56	13
Red soil (14)	89	43	43	49	14
Blacksoil (16)	63	71	32	12	47

CONCLUSION

Present investigation have clearly indicated that the association of plant parasitic nematodes especially the most an important nematodes species like *Rotylenchus reniformis* *Meladogyne incognita*, *Tylenchorhynchus*, *Hoplolaimus* spp, and *Paratylenchus* spp would cause severe economic yield loss to cotton plantation in Khammam district of Andhra Pradesh, India; if the management practices are not being government to kept the nematodes population under check. In order overcome these problems, Integrated nematode Management schedule be adopted at the earliest for greater yield of Cotton in those areas.

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