J. Phytol Res. 7 (2) : 127-130, 1994

SURVEY OF PLANT PARASITIC NEMATODES ASSOCIATED WITH *SESAMUM* CROP IN JAIPUR DISTRICT, RAJASTHAN, INDIA

NEERAJA SHARMA and P.C.TRIVEDI

Department of Botany, University of Rajasthan, Jaipur-302 004, India.

Detailed study on occurrence of plant parasitic nematodes associated with *Sesamum* was done in and around Jaipur. Phytonematodes associated with sesamum crop were species of *Heterodera, Helicotylenchus, Hoplolaimus, Pratylenchus, Xiphinema, Meloidogyne, Tylenchorhynchus, Rotylenchus* and saprozoic. *H. cajani* was found pathogenic to *Sesamum* causing heavy damage to crop.

Keywords: *Heterodera cajani; Sesamum indicum; Survey.*

Introduction

Sesamum is an important oil seed crop of Rajasthan. Crop severely suffers with nematode infestation. Limited information is available about the association of phytonematodes in *Sesamum* fields[1]. Therefore, a systematic survey was conducted to locate the different nematodes and their role in the development of disease.

Materials and Methods

Survey of *Sesamum* fields was conducted during growing season in 1992 in Jaipur district. Random selection of fields to be surveyed was categorized on the basis of above ground symptoms of nematode infestation. Soil samples were collected from the *Sesamum* fields at considerable distance to locate difference in nema population in relation to varied agroclimatic conditions. Samples were collected from the rhizosphere of plants at the depth of 15-20 cm by a digger[2]. Eight to ten sub-samples comprised a composite samples of 500 gm soil, homogeneously mixed and filled in polythene bags tagged with relevant information and tied. Further processing in the laboratory constituted extraction of nematodes from soil and their counting. This was done by Cobb's sieving and decantation method[3] followed by modified Baermann's funnel technique[4]. After 48 hours the aliquot was collected in 250 ml beaker and thoroughly bubbled. Ten ml of nematode suspension was taken in a counting dish and counted under stereomicroscope. The nematode number in suspension was derived on volumetric method. The nematodes were identified to generic species level using standard key. Per cent occurrence of phytoparasitic nematodes was also calculated.

Results and Discussion

The per cent occurrence of nematodes in eleven localities of surveyed area were given in Table 1. A number of plant parasitic nematodes were isolated from the rhizosphere of *Sesamum* plants. The diseased plants were relatively stunted and showing yellowing of leaves. Size, number and quality of pods were reduced in these plants. In the root-knot infected area galls were found on the roots and plants infested with cyst nematode had sparse root system with bunchy appearance. Cysts were found attached to the roots.

Following nematodes were found in association with *Sesamum* crop :

Heterodera Schmidt : Stylet with concave basal knobs present. Females lemon shaped with prominent neck and Vulval concave. Mature female greatly enlarged found in roots of plants, either embedded or attached by neck, mature females becoming cysts, pyriform - saccate, spheroid, usually without a tail. Females with no irregular body annules around perineum, excretory pore posterior to median bulb, lip region with two lateral lips narrower than 4 sublateral lips. Second stage larval stylet usually more than 20 µm and less than 30 µm, well developed labial frame work. Cuticle with lacelike pattern. Cyst stage formed. Vulva terminal, anus dorsal, not on vulva lip, or vulva sunken into terminal vulval cone with anus on upper inside or dorsal vulval lip.

Heterodera cajani Koshy, 1967

Measurements: (in µm)

Second stage larvae:Length=452-500 Width 17-27

Male Length=833-129 Width 27-33

Female Length=366-433 Width 133-167

Cyst Length=666-799 Width 433-566

Egg Length=103.2-133 Width 50-67

Description: Head well sclerotized, bearing 3-5 annules, head length 4-5 µm, width 7-10 µm, stylet with well developed anteriorly directed knobs. Hyaline tail approximately half the tail length, tail terminus slightly pointed to blunty rounded.

Females : Lemon shaped with protruding neck and vulva. Neck longer than the posterior protuberance. Egg sac, half and sometimes double the size of female present. Subcrystalline layer present.

Eggs : Generally more than double in length than width, egg shell hyaline, second stage larvae in four folds inside the eggs.

Cysts : Lemon shaped, light to dark brown in colour. Remains of subcrystalline layer evident on some cysts. Cuticular pattern of cyst is zig-zag. Bullae present, Fenestra on the cone top is of the ambifenestrate type.

Males : Cephalic sclerotization very prominent bearing 4-6 annules. Head length 5-6 µm, width 8-10 µm. Tail very short, blunty rounded.

Meloidogyne Goeldi, 1887

Stylet with basal knobs present. Head without setae second stage larval stylet less than 20 µm, weekly developed labial frame work. Mature female greatly enlarged (pear shaped or lemon shaped), found in roots of plants either embedded or attached by neck,mature females remain soft bodied, usually without a tail. Females with irregular body annules around perineum, exceretory pore at level with stylet or close behind it, lip region with 2 lateral lips wider than 4 sublateral lips. Usually marked galling of the host root is seen. Males with spicules and gubernaculum.

Meloidogyne incognita (Kofoid & White, 1919) Chitwood, 1949.

Measurements:

Female Length = 500-723 µm

Width = 331-520 µm

Male Lenght = 1108-1953 µm

Larvae Lenght = 337-403 µm

Description

Female: The head has 2-3 annules behind the labial disc and stylet 13-16 µm long with rounded knobs that may be extended laterally. Excretory pore at level of or posterior to spear knobs, 10-20 annules behind head.

Perineal pattern

Posterior cuticular pattern with strial closely spaced, very wavy to zigzag especially dorsally and laterally. Dorsal arch high, rounded. Lateral field not clear, sometimes marked by breaks in striae, broken ends forked, pattern merging into body striae.

Male : Head not offset, a high trancete cone shape, clearly annulated. Tail blunty rounded, terminus instriated. Phasmids at cloaca level or just anterior. Spicule slightly curved, gubernaculum-crescentic.

Larvae: Head not offset, truncate cone shaped in lateral view, sub-hemispherical in dorso-ventral view. Stylet knobs prominent, rounded. Hemizonoid 3 annules long, just anterior to excretory pore. Lateral field with 4 incisures, outerbands cross striated. Rectum inflated. Tail tapering to sub-acute terminus striae coarsening posteriorly.

Helicotylenchus Steiner, 1945

Body length = 0.50 - 1.20 mm

Under a dissecting microscope nematode body is typically arcuate or spiral in shape when dead or relaxed.

Hoplolaimus Daday, 1905

Body length = 1.0 - 2.0 mm

Body shape vermiform, female with rounded tail. These are relatively large nematodes, when relaxed with gentle heat, individual assume a straight or slightly arcuate position.

Pratylenchus Filipjev, 1934

Body length = 0.40 - 0.80 mm

Under a dissecting microscope some diagnostic characteristics are the overlapping esophagus, the flat head and the relatively slow graceful movement. When at rest or dead nematode lie in a straight line.

Xiphinema Thorne & Allon, 1950

Body length = 1.50 - 5.00 mm

Under the dissecting microscope body typically long and thin, slender without annulation. When at rest these nematodes assumes the shape of wide 'C'.

Tylenchorhynchus Butschli, 1873

Body length = 0.6 - 1.4 mm

Under a dissecting microscope, the non-overlapping esophagus, the conical tail and the strong stylet with distinct basal knobs aid in identifying of this nematode. When relaxed they assume a wide 'C' shaped.

Rotylenchulus Linford and Oliviera, 1940

Body length = 0.60 - 0.90 mm

Female body is kidney shaped with pointed tail is a characteristic feature for identification.

The results as exhibited in Table 1 indicate that eight genera were found associated with Sesame plant. The associated nematodes were *Heterodera, Helicotylenchus, Hoplolaimus, Xiphinema, Meloidogyne, Tylenchorhynchus* and *Rotylenchus* in 67.3, 86.5, 73.0, 75, 80.76, 5.7, 50 and 44.2 per cent respectively. Occurrence of saprozoic nematodes were observed 100 per cent in all the thirteen localities. *Heterodera* was found 100 per cent in Pagodiawala Village, Sarangpura, Mokhampura and Khudiala village. Cyst nematode was found in all the surveyed area except Sanganer and Jaipur. The spiral nematode *Helicotylenchus* was another prevalent nematode found in all the localities except Dewala. The lence nematode *Hoplolaimus,* lesion nematode *Pratylenchus* and dagger nematode *Xiphinema* were present in every surveyed locality (Table 1). Root knot nematode *Meloidogyne* was found in two localities of surveyed area i.e. in Sanganer and Jaipur. *Tylenchorhynchus* was another nematode causing stunting of plants found with the crop. It was found in all the surveyed area except Dewala. *Rotylenchulus* was found

associated with plants in all the eleven localities maximum being Bagat and Sarangpura (Table 1). Infestation of *Heterodera cajani* was found to be a serious problem in most of the surveyed areas. In Khudiala village, Sarangpura and Mokhampura where intercropping of Sesame was found with Mung and Guar, these crops are collateral host of *H. cajani* and multiplying the pathogenic threshold by manifolds and caused heavy losses to the crops. In Pagodiawala village and Narena village where previous crop was Moth, which is also a good host of *H. cajani* . Here also heavy infestation of nematode was noted.

From these observations it is conculded that various nematodes associated with Sesame crop are causing heavy economic losses to the growers of this area. Suitable control measure should be used to control the further multiplication of these pest in the area.

Acknowledgement

Authors thank to DST, New Delhi for financial assistance and the Head, Department of Botany, for providing facilities during the course of study.

Table 1. The occurrence of nematodes in various localities of Jaipur district.

Locality surveyed	No. of samples	Per cent occurrence of phytoparasitic nematodes in *Sesamum* field								
		Het.	Hel.	Hop.	Pra	Xip.	Mel	Tyl	Roty	Sap
1. Dewala	4	50 (2)	-	75 (3)	100 (4)	100 (4)	-	-	25 (1)	100 (4)
2. Mateda	4	75 (3)	100 (4)	75 (3)	100 (4)	75 (3)	-	50 (2)	25 (1)	100 (4)
3. Narena	16	81.25 (13)	100 (16)	62.5 (10)	75 (12)	75 (12)	-	56.2 (9)	56.2 (9)	100 (16)
4. Khudiala Village	4	100 (4)	100 (4)	50 (2)	75 (3)	100 (4)	-	75 (3)	50 (2)	100 (4)
5. Dudu	4	25 (1)	75 (3)	100 (4)	50 (2)	50 (2)	-	50 (2)	25 (1)	100 (4)
6. Bagat	3	66.6 (2)	100 (3)	100 (2)	66.6 (2)	100 (3)	-	66.6 (2)	66.6 (2)	100 (3)
7. Mokhampura	3	100 (3)	100 (3)	100 (3)	100 (3)	100 (3)	-	66.6 (2)	33.3 (1)	100 (3)
8. Pagediawala Village	4	100 (4)	100 (4)	75 (3)	75 (3)	100 (4)	-	50 (2)	50 (2)	100 (4)
9. Sarangpura	3	100 (3)	100 (3)	65.6 (2)	100 (3)	100 (3)	-	33.3 (1)	66.6 (2)	100 (3)
10. Sanganer	4	-	75 (3)	75 (3)	25 (1)	50 (2)	50 (2)	50 (2)	25 (1)	100 (4)
11. Jaipur	3	- -	66.6 (2)	75 (3)	66.6 (2)	66.6 (2)	33.3 (1)	33.3 (1)	33.3 (1)	100 (3)
Total Samples	52	35	45	38	39	42	3	26	23	52
Average % Occurrence		67.3	85.5	73.0	75	80.76	5.7	50	44.2	100

References

1. Verma AC and Yadav BS 1975, *Indian J. Nematol* 5 235
2. Barker KR 1978, *In ; Methods for evaluating plant fungicides nematicides and bactericides* E.I.Zeha (ed) Am.Phytopath. Soc., St. Paul Minn, 114
3. Cobb NA 1918, Estimation of the nematode population of the soil *Agric. Tech. Cir. Bur. Pl. Ind. U.S. Dep. Agric* 1 48
4. Christie JR and Perry VG 1951, *Pro.Helimenths. Soc. Washington 18 106*