

Studies of Nematodes Associated with Okra (*Abelmoschus esculentus* (Linn) Moench) in District Bilaspur, Himachal Pradesh

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Abstract- Nematodes are commonly referred to as non segmented round worm, thread worms or pin worms. It's body is elongated, cylindrical, bilaterally symmetrical and tapering towards both end. It is pseudocoelomate and dioecious with sexual dimorphism. It's impact on agriculture by way of inflicting is quite substantial. In the District Bilaspur of Himachal Pradesh, in the present study on nematodes, two types of nematodes have been detected from the roots and rhizosphere of okra crop. These two are Ectoparasitic and Endoparasitic. The present study also reveals that percentage of *Meloidogyne incognita* is quite high in some parts of the District of Bilaspur. Okra is susceptible to root-knot nematodes damage. If Okra is to be grown in areas prone to nematode attacks Nematicide must be sprayed prior to planting. Non chemical management of nematodes can be accomplished through the use of soil solarization, crop rotation or the use of nematodes suppressive crops.

Index Terms- Nematodes, Okra, *Meloidogyne*, Rhizosphere and *Pratylenchus*

I. INTRODUCTION

Okra is one of the important vegetable crops in India. The area under okra cultivation in India is 3, 69,654 hectare with a production of 2,31,661 tones showing the productivity of 6.28/hect. The state of Himachal Pradesh also contributes towards okra cultivation and it is an important crop which is sown in almost all parts of the states. Nematodes damage commonly causes irregular growth and reduced or delayed production. Okra is infamous for its susceptibility to root-knot nematodes damage. Okra plant damage by root-knot nematodes is usually stunted and appears unhealthy with elongated, round swelling on both large and small roots. The present study is undertaken to find out various nematode species associated with okra crop from different localities (Chandpur, Oel, Lakhampur, Nauni, Rishikesh, Harlog and Jukhala) of District Bilaspur of Himachal Pradesh. Two genera of endoparasitic and ectoparasitic nematodes have been detected from the roots and rhizosphere of okra.

II. MATERIAL AND METHOD

The soil samples were collected from rhizosphere of okra crop from different localities of District Bilaspur. For the collection of Soil samples a particular field was selected .From

this field six rows were selected and from each pair of rows 8-10 samples of soil were collected from the depth of 20-30 cm and then all the samples were put in the same polythene bag and labeled with crop locality and date of collection before bringing these to the laboratory for further processing. Similarly, for root sampling the roots of weak plants suspected to be infected with endoparasitic nematodes were exposed and roots showing galls were carefully extracted. These root samples were brought to the laboratory and kept at 5° C so as to maintain their optimum moisture. Cobb's decanting and sieving method (Cobb,1918) was used for washing the soil samples and nematodes were extracted from the muddy suspension by using Schindler's modification (Southey, 1970) and then frequency of nematodes occurrence was worked out on the basis of number of sample infested. 8% boiling formaldehyde solution was used for killing and fixing. The clearing was done by glycerol ethanol (Seinhort's) method. Then mounting was done in glycerol. For the identification of root-knot nematodes the mounts of the adult female *Meloidogyne* species were prepared and for this females were removed from root tissues and collected in a cavity block having warm lactophenol. Working under stereomicroscope, the swollen female was pierced with a sharp blade .The cut end was trimmed further for obtaining the perineal pattern in a piece of cuticle only. The perineal pattern was studied under the compound microscope for the identification of species. The identification was done on the basis of 'C.I.H. Descriptions of plant parasitic Nematodes'. The specimens were measured with the help of ocular and stage micrometers.

III. RESULT & DISCUSSION

Results indicate that root-knot nematodes were found in all the regions surveyed during this study.

1. *Meloidogyne incognita*

Mature female: Round to pear shaped with short projecting neck, white and sedentary. Vulva and anus closed together, terminal; perineum with fingerprint like cuticular pattern, elevated in some species. Endoparasitic, body spherical with projecting neck (Fig.1, 2). Head with 2 or occasionally 3 annules behind head-cap. Cuticle thickening abruptly at the base of relaxed spear. Spear knobs rounded or drawn out laterally. Excretory pore at level of posterior to spear knobs, 10-20 annules behind head. Posterior cuticular pattern displays more variation than any other known species. Typical pattern "incognita type" with striae closely spaced, very wavy to zig-zag (Fig.3).

Female

L=720-960 μm
Width=360-510 μm
Length median bulb=36-45 μm
Width median bulb=33-36 μm
Spear= 15-16.5 μm



Figure 1



Figure 2



Figure 3

Meloidigyne

Male: Vermiform, up to 2mm long, tail end twisted, develops by metamorphosis within a swollen juvenile. Cuticle strongly annulated; lateral field with four incisures. Cephalic region rounded, not sharply offset, with distinct labial disc and few (one to three) annulations. Oesophageal glands mostly ventral to intestine. Spicules slender, generally 25-33 μm long,

gubernaculum s 7-11 μm long. Testis single or paired when sex reversal occurs. Tail rounded. Phasmids dot like, near cloacal aperture, which is subterminal. Bursa absent.(fig.4-6).

Male

L=660-1302 μm
Length median bulb=18-24 μm
Width median bulb=9-12 μm
Spicules= 18-21 μm
Gubernaculum = 4.5 μm
Stylet length= 15-18 μm



Figure 4



Figure 5



Figure 6

Pratylenchus

Female: Body is about 0.43-0.45 mm long(Fig.7). Cephalic region is low, flattened anteriorly, continuous with body contour (Fig. 8). Stylet with rounded, anteriorly flat basal knobs. Median bulb rounded. Vulva in posterior half of body, only anterior ovary functional, post vulval uterine sac present (Fig. 9). Posterior half of body flexed in a manner so that the vulva and anus lie on the convex surface. Tail conoid and terminus smooth (Fig.10)

Male: not found

Female :

L	0.43 μm	0.45 μm	L=total body length
a	20.5 μm	25 μm	a= total body length/maximum body width
b	7 μm	7.5 μm	b= total body length/oesophageal length
c	15 μm	46.66 μm	c= total body length/ tail length
c'	1.5 μm	3.3 μm	c'=tail length /anal body diameter
v	69.76 μm	73.3 μm	v=position of vulva expressed as a percentage of the body length as measured from interior end.
stylet Length	12 μm	15 μm	



Figure 7



Figure 8



Figure 9



Figure 10

Meloidogyne incognita was most widely distributed among the most common species and was found in all regions. *Pratylenchus* species. were next and were found in Lakhanpur, Nauni, Harlog, Jukhala area of Distt. Bilaspur. The variance may be ascribed to the particular soil characteristics and climate of the

study area. Region which contains large proportion of sand gravels is found suitable for the development of root-knot nematodes. In other regions where temperature is too low, rainfall is scanty and soil texture is clayey, environment is not suitable for the development of root-knot nematodes

Summary

During the present investigation two genera of plant parasitic nematodes have been detected from the roots and rhizosphere of okra crop from different areas viz., Chandpur, Oel, Lakhanpur, Nauni & Rishikesh Harlog, Jukhala of Distt. Bilaspur. Out of these two genera one was ectoparasitic and another was endoparasitic. The observation includes

Meloidogyne incognita (Kofoid & white, 1919) Chitwood, 1949

Pratylenchus sp. Fillpjev, 1936

The percentage of incidence of *Meloidogyne incognita* is quite high in Chandpur (50%) & Lakhanpur (54.5%) locality

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