



MORPHOLOGICAL VARIATIONS OF GENUS *MESOCRICONEMA* *XENOPLAX* ANDRASSY, 1965 ON COTTON – A STUDY FROM MALWA REGION OF PUNJAB

^aHarpreet Kaur, ^aNeelam Thakur, & ^bM. Luqman Khan

^aDepartment of Zoology, Punjabi University, Patiala-147002

^bSenior Nematologist & HOD, Department of Entomology, UHF, Nauni, H.P. Solan.

Note: All Researchers have equivalent write of this research

ABSTRACT

Studies were carried out for the identification and morphological variations of *Mesocriconema xenoplax* belonging to the order Tylenchida family Criconematidae Taylor, 1936. In total 260 soils and root samples from different localities were collected and processed for the isolation of nematode species. The present study indicates that the most frequently occurring nematode species was *Mesocriconema xenoplax*, beside other nematode genera are: *Hemicriconemoides cocophillus*, *Hirschmanniella gracilis*, *H. mucronata*, *Hoplolaimus indicus*, *H. columbus*, *Helicotylenchus dihystra*, *Tylenchorhynchus mashoodi* and *Xiphinema americanum* were also encountered in low to very high population. Observations on the adult female of *M. xenoplax* indicated some characters were variable as; body length, length of stylet, body length in correspondence to oesophageal length and number of body annules from posterior end to vulva. Whereas the most stable characters observed were total number of body annules, position of vulva and value of “a”.

KEY WORDS: – *Mesocriconema xenoplax*, cotton, morphological variation

INTRODUCTION

Cotton plantation is constantly under attack by a variety of pathogens including bacteria, viruses, fungi, nematodes and insects. Estimated annual yield losses in the world's major crops due to plant parasitic nematodes are about 12.3 % and it is 14% in the developing countries (Sasser and Freckman, 1987). In India, recent estimate showed nematode alone is responsible for both quantitatively and qualitatively yield losses amounting about Rs. 240 billion every year (Sehgal and Gaur, 1999). They parasitize the roots stems, seeds, leaves and buds of plants and reduce their ability to produce yields, make them weak and perhaps vulnerable to many pests and diseases. Damage to crops by nematodes often goes unnoticed or attributed to other causes such as lack of fertility, deficient soil moisture. During the last 40 years in India, mainly because of increased demand of food and clothes, significant work has been done on nematode problem in fiber crops in particular. For correct identification of these pathogens causing yield losses to cotton, the intensively taxonomic study was taken over by Mehta & Raski, 1971; Khan *et al.*, 1975; Andrassy, 1979; Ebsary, 1981. Genus *Macroposthonia* and related genera were revised, synonymized by several nematologists independently and more or less simultaneously; the confusing result including conflicting definitions of genera as well as contradictions in proposed species synonyms to *Criconemella* De Grisse & Loof, 1965 and then to *Mesocriconema* Andrassy, 1965 were based on the fact that *Criconemoides* had not been

validly established, opinion has drawn for the validity of *Mesocriconema* Brzeski *et al.*, (2002).

MATERIAL AND METHODS

Soil and root samples were collected at different localities in different districts of Malwa region of Punjab. Samples were collected after digging up to the depth of 30 cm at a distance of 60-90 cm away from plant. The soil along with the feeder roots was collected in polyethylene bags and brought to the laboratory for analysis. In laboratory, active nematodes were extracted by using sieve and Baerman's funnel methods. Roots were stained with acid fuchsin and then transferred into lacto phenol to observe the sedentary endoparasitic nematodes. For identification, nematodes were killed and fixed in TAF. The cleared nematodes were mounted in a drop of pure desiccated glycerine on a clean glass slide. To prevent crushing by the cover slip three small pieces of glass wool were placed on the margins and sealed with nail polish. Identification was made according to the key given by Siddiqi (2000) and Brzeski *et al.*, (2002).

RESULTS AND DISCUSSION

Identification of *Mesocriconema xenoplax* Andrassy, 1965 belonging to the family Criconematidae Taylor, 1936 associated with cotton in Malwa region of Punjab. Out of 260 soils and root samples collected and processed for the isolation identification of nematode revealed the presence of *Hemicriconemoides cocophillus*, *Hirschmanniella gracilis*, *H. mucronata*, *Hoplolaimus indicus*, *H. columbus*, *Helicotylenchus dihystra*, *Tylenchorhynchus mashoodi*, *Xiphinema* and *Longidorus* spp. The data dealing with morphological variations in *M. xenoplax* as presented in table I- IV, it is evident that the tail length and gonad lengths were not proportional to the body length.

This is highly variable character in all the populations in Malwa region of Punjab and differs from the original population Andrassy, 1965. The spear length, body length, values of a, b, and total number of body annules making them reliable taxonomic characters. The number of annules on tail, on anus to vulva and from posterior end to vulva making them variable. However, the position of vulva from anterior end, stylet % length, stylet % oesophagus, cp% stylet is least variable having CV% values less than 5. During the present study frequency of infestation with *M. xenoplax* was maximum in Bathinda (50%) followed by Bhawanigarh (40%) and Barnala (39%) districts of Punjab. In order to generate information on intraspecific variations of *M. xenoplax*, morphological and morphometrical observations were undertaken. The observed variations among the populations in the tail length, tail annules, width of median bulb, vulval body width, anal body width, number of annules on tail, number of annules between vulva and anus and total number of body annules were observed. Similar data have been provided by Penova *et al.*, (2000) who recognized seven criconematid species of *Ogma menzeli*, *Criconema annuliferum*, *C. princeps*, *Criconemoides pleriannulatus*, *Mesocriconema solivagum*, *M. xenoplax* and *Xenocriconemella* from soil samples collected from oak forests in Russia and also studied their intraspecific variability of this group of plant parasitic nematodes. Pinkerton *et al.*, (1999) recorded *Mesocriconema xenoplax*, *Xiphinema americanum*, *Pratylenchus* spp., and *Paratylenchus* spp. and *Mesocriconema xenoplax* was found at greatest population densities. Jairajpuri and Siddiqi (1963) recorded three new species of the genus *Criconemoides* Taylor, 1936 from the north India and Jairajpuri (1963) also collected *Criconema similaensis* form India. Karanastasi *et al.*, 2008 recorded *M. xenoplax* the ring nematodes first time inhabiting the roots of *Viburnum* sp. plants in Greece. Vovlas *et al.* (1991) described *Mesocriconema ornicauda* and *Ogma floridense* from two habitats of central and northwestern Florida.

Genus: *Mesocriconema xenoplax* (Andrassy, 1965)

Measurements:

Patiala population (20 ♀♀): R = 90-103; L = 0.57-0.64 mm; a = 9.48-10.91; b = 3.6-4.04; c = 20-25.59; V = 92-94%; St = 71-76; Rv = 6-9; Rvan = 4-6; St %L = 11.81-13.23; VL/VB = 0.7

Barnala population ((15 ♀♀): R = 90-96; L = 0.48-0.51mm; a = 9.20-9.49; b = 15-16; c = 11.35- 21.25; V = 94-95%; St = 74-78; Rv = 7-8; Rvan = 2-3; Ran = 5-7; St %L = 15.05-145.16; VL/VB = 0.38-0.60

Bathinda population ((10 ♀♀): R = 90-103; L = 0.51-0.69 mm; a = 10.35-12.85; b = 8.7-11.68; c = 16.73-27.76; V = 93-95%; St = 71-74; Rv = 7-9; Rvan = 1-2; Ran = 6-7; St %L = 10.66-13.78; VL/VB = 0.40-0.87

Barwala population ((10 ♀♀): R = 90-98; L = 0.54-0.60 mm; a = 11.17-12.42; b = 3.67-5.49; c = 18-20; V = 93-94%; St = 68-74; Rv = 7-9; Rvan = 1; Ran = 6-7; St %L = 11.67-13.16; VL/VB = 0.7

Description: Female: Plump nematodes, 0.3-0.6 mm long. Body cylindroid except at both the extremities. Annules without anastomosis. Sub lateral labial lobes conspicuous. First cephalic annule indented, not circular, somewhat cup shaped; second slightly wider, defiantly set off by a constriction. Remaining body annules rounded, slightly retrorse, numbering about 112. Spear massive, 71-78 µ long, basal knobs anteriorly directed. Median bulb not conspicuous, fused with procorpus, tapering to a short isthmus, basal bulb small, rounded, pear shaped. Excretory pore and hemizonid not observed. Vulva usually on 7th or 8th annule from tail terminus. Ovary outstretched, single, prodelphic without post- uterine sac.

Male: Not found

Host and Locality: The present population of *M. xenoplax* collected from the soil around the roots of cotton fields from Patiala, Barnala and Bathinda, Punjab. Specimens were mounted in anhydrous glycerine on glass slides and kept in the departmental nematode collection,

Diagnosis and relationship: The present populations of *Mesocriconema* agree well with the original description of *M. xenoplax* (Raski, 1952) Loof & De Grisse, 1989.

TABLE- I: Survey for *M. xenoplax* (n = 55 ♀♀) associated with cotton in different districts of Malwa region of Punjab

Place	No. of Localities	No. of samples	No. of infected samples	Population range /200 CC of soil
Patiala	6	50	10	60 – 110 (20 %)
Barnala	4	66	26	20 -100 (39.39 %)
Bhathinda	5	69	35	10 – 120 (50.72 %)
Bhawanigarh	4	75	30	30 – 60 (40%)
Total	19	260	106	

Figures in parenthesis indicate per cent frequency of occurrence

$$\text{Frequency of occurrence} = \frac{\text{No. of samples infested}}{\text{Total no. of samples}} \times 100$$

TABLE-II Comparison of the gross range of morphometrical data recorded of 4 populations of *M. xenoplax* (Orton William (1972), Loof & De Grisse (1989) and Brzeski *et al.*, (2000).

Measurements	As per Orton William 1972	As per Loof & De Grisse 1989	As per Brzeski <i>et al.</i> 2000	Gross range in 4 populations
L	0.54 – 0.63mm	0.59 (0. 56 -0.67) mm	0.40-0.75mm	0.48- 0.69mm
A	11.3 – 12	13.2 (12 – 15)	8.5-11.9	9.2 – 12.64
B	3.9 – 4.2	4.2 (4.0 – 4.3)	0.04-5.5	3.65-11.68
C	17 – 19	21.0 (19.0 –23.4)	22.3-35.5	14.33-27.76
V%	91 – 93 %;	92 (91 – 93%)	91-95 %	92-95 %
Stylet	76 – 78	81.0 (77.5 – 85.0	54-87	54-87
Tail	-	-	13.5-25.5	13-35
R	106 – 109	109 (104 – 116)	77-114	90-102
Ran	6 – 7 th	7 – 8	4-7	4 - 7
Rvan	-	-	0-4	1- 3
RV	8 – 9 th	8 – 9	6-11	6- 9
St%L	-	-	10-14.6	10.66-15.23
St%Oes	-	-	-	27-147
Cp%St	-	-	63.6-76.3	
VL/St	-	-	0.4-0.7	Variable

TABLE III: Morphometric variations in *M. xenoplax* (n = 55 ♀♀) populations in Malwa region of Punjab

Char	Patiala	Barnala	Bathinda	Bhawanigarh	C.V.%
L	579 ± 9.7 (579 – 643) 1.67	501 ± 6.36 (488 – 518) 1.26	602 ± 73.61 (516 - 694) 12.22	571 ± 42.9 (546 – 606) 7.51	Variable
A	10.25 ± 0.56 (9.48 – 10.91) 5.46	9.29 ± 0.2 (9.2 – 9.49) 2.15	11.75 ± 1.02 (10.33-12.64) 8.68	11.84 ± 0.88 (11.17 – 12.42) 7.43	Stable
B	3.84 ± 0.2 (0.04-5.5) 5.20	9.23 ± 0.3 (8.77 – 9.74) 3.25	9.9 ± 1.2 (8.56 – 11.68) 12.12	4.58 ± 0.64 (93.67 – 5.49) 13.97	Variable
C	20.75 ± 4.85 (22.3-35.5) 23.37	19.71 ± 0.88 (17.86 – 22) 4.46	22.03 ± 4.3 (16.73 – 27.76) 19.15	18.67 ± 0.32 (17.74 – 20.07) 1.71	Highly Variable
V%	93.16 ± 0.94 (91-95) 1	94.46 ± 0.27 (94 – 95) 0.28	94.08 ± 0.85 (93 – 95.4) 0.90	93.66 ± 0.7 (93 – 94) 0.74	Stable
Stylet	73.5 ± 10.54 (74 - 76.96) 14.43	75.97 ± 1.04 (74- 78.44) 1.36	72.52 ± 1.48 (71-74) 2.04	71.33 ± 2.82 (68 – 74) 3.95	Variable
Tail	29.59 ± 7.17 (22.2 – 39.96) 24.23	26.14 ± 3.13 (22.2 – 29.6) 11.97	28.12 ± 6.04 (23.68 – 38.48) 21.47	31.08 ± 4.18 (28.12 – 35.52) 13.44	Highly Variable
R	98 ± 5.68 (90 -102) 5.7	93.33 ± 1.41 (90 – 96) 1.51	96.66 ± 2.88 (93 – 101) 2.97	94 ± 4.24 (91 – 97) 4.51	Stable
Ran	5 ± 1 (4 – 6) 20	5.66 ± 1.41 (5 -7) 24.91	6.5 ± 0.54 (6- 7) 8.30	6.33 ± 0.7 (6-7) 11.05	Highly Variable
Rvan	2.33 ± 0.54 (2 – 3) 23.17	2.33 ± 0.7 (2- 3) 30	1.5 ± 0.54 (1-2) 36	1 ± 0 (1) 0	Highly Variable
RV	7.83 ± 0.7 (7 – 9) 9	7.66 ± 0.7 (7 -8) 9.13	7.66 ± 0.54 (7- 9) 7.04	7 ± 1.41 (6-8) 20.14	Variable
St%L	12.66 ± 0.58 (11.81 -13.23) 4.58	15.1 ± 0.028 (15 – 15.2) 0.18	12.1 ± 1.29 (10.66 – 13.78) 10.66	12.4 ± 0.6 (11.6-13.16) 4.83	Variable
St%Oes	129.83 ± 3.27 (124 -132) 2.51	139.33 ± 4.94 (132 – 147) 3.55	119.83 ± 22.38 (91-133) 18.67	49.3 ± 4.68 (27 – 63.6) 9.49	Highly Variable
Cp%St	72.11 ± 1.33 (71 – 74.64) 1.84	77.15 ± 3.95 (73 – 79.92) 5.11	77.73 ± 1.96 (74 – 80) 2.52	71.75 ± 2.56 (72 – 82) 3.23	Stable
VL/St	0.265 ± 0.04 (0.21 – 0.30) 15.38	0.517 ± 0.65 (0.2 – 1.13) 12.7	0.28 ± 0.02 (0.22- 0.47)	0.31 ± 0.05 (0.24- 0.46) 15.28	Highly Variable

Highly Variable (if C.V. % differences 15.8 and more);

Variable (if C.V. % differences between 9 and 16); Stable (if C.V. % differences less than 5).

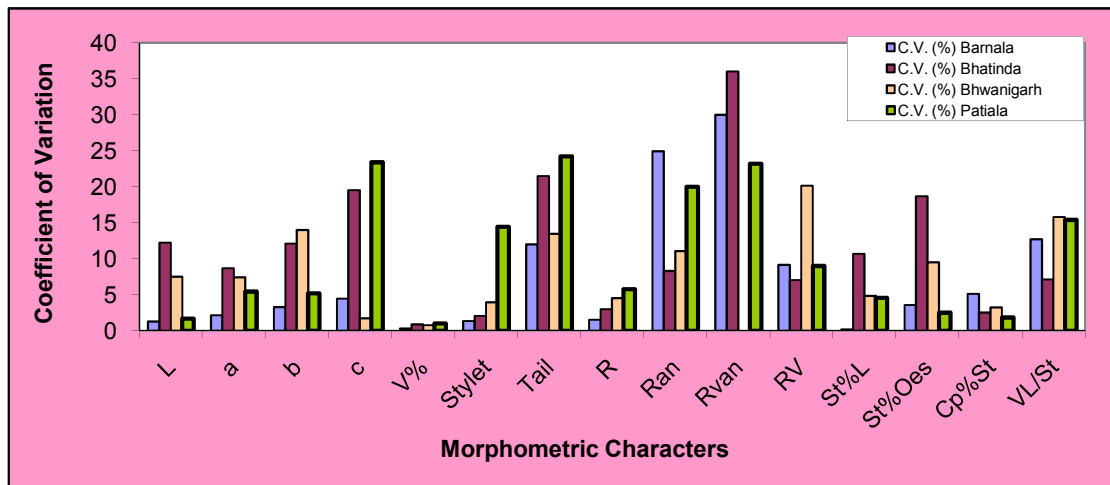


FIGURE1: Morphometric variations in *M. xenoplax* (n = 55 ♀♀) from four sites population in Malwa region of Punjab.

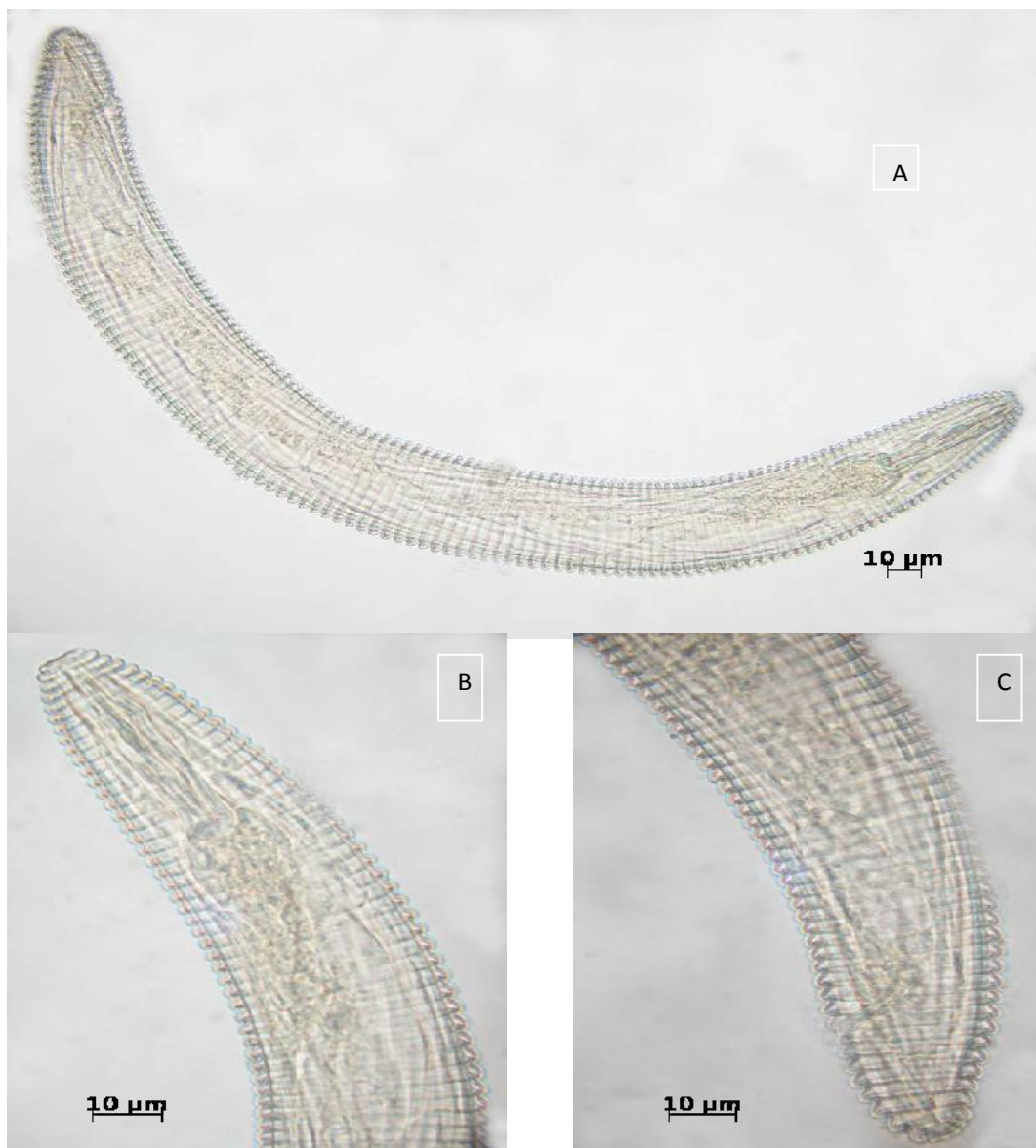


FIGURE 2. A-C. *M. xenoplax* A: Entire female; B: Anterior end with oesophageal region; C: Tail.

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