Voyager: Vol. VI, Dec. 2015, 96-103 : 2015
ISSN :0976-7436 : INDEXED AND ABSTRACTED

Morphological Study Of Dominant Plant Parasitic Nematodes Associated With Sugarcane In Meerut.

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Abstract

Nematodes are diverse metazoans with an estimated total number of a million species (Lambshead, 2004). Plant parasitic nematodes cause about 77 billion dollars annual loss to the crops throughout the world. Nematodes have been known to cause crop losses in sugarcane for many years. Whereas they were once considered only a pest in coarse textured sandy soil, it was studied that nematodes are responsible for significant yield loss in sugarcane crop in district Meerut. Soil samples were collected from sugarcane fields in all the seasons from various fields. After processing of samples different genera of plant parasitic nematodes were identified from soil samples. The identification of plant parasitic nematodes was done on the basis of taxonomic keys as stylet, esophageal, median bulb, vulva or spicules. The identified genera of nematodes of sugarcane from district Meerut were Hoplolaimus, Tylenchus, Rotylenchus, Helicotylenchus, Pratylenchus, Hoplolaimus and Helicotylenchus.

Keywords:*sugarcane, plant parasitic nematodes, soil sample, root sample.*

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is the second largest producer of sugarcane after Uttar Pradesh in area and after Tamilnadu in productivity. In India, sugarcane is mainly used for the production of white sugar (50%), Gur and Khandsari (40%). Molasses, an important by-product of sugar industry is used for alcohol production. The objective of this work was to identify most important plant parasitic nematodes associated with sugarcane crop of district Meerut.The distribution and taxonomic study has great significance to overcome the problem of these nematodes. It will provide the appropriate management tools and practices to control the population of the plant parasitic nematodes according to the cropping patterns of the particular agriculture areas. .

Materials And Methods

Experimental Site

The experimental work was conducted in sugarcane field of district Meerut of Uttar Pradesh. Meerut region is located between 23^0 11^1 E and $77^0$11N altitudes and also located in the between two river Ganga and Yamuna. Soil samples were collected at tahseel level from different villages/locations such as, Sardhana, (Daurala, Sarswa and Mavi, Lawar), Mawana (Parikshatgarh, Ulkhpur, Hastinapur, Incholi, and Kila), and Meerut (Fafunda,Kharkhoda, Rithani, Partapur and Gaggol). The sugarcane field in Meerut is characterized by cool, wet sandy soil, loam soil which is often irrigated.

Soil Sampling

Sugarcane field were randomly selected for sampling. 15, 25, and 30 soil samples were collected from the rhizosphere of each site using a soil auger. Soil samples collected at depth of 10-15 cm in field site. A total of 230 samples collected periodically from March 2013 to August 2014, by adopting the method of Wallace (1971). The soil samples sealed in polythene bags and kept away from sun. The samples were properly labeled and taken to Nematology Research Laboratory, in Zoology Department of C.C.S. University, Meerut for analysis and identification of plant-parasitic nematodes.

Nematode Extraction From Roots and Soil and their identification

Nematodes was extracted and mounted within a week from collected soil samples. For endoparasitic nematodes, the roots were held and placed in petridishes, washed with clean water. A sub-sample of 250g roots was taken for nematode extraction using a modified Baermann funnel technique (Hooper et al., 2005) after maceration in a blender. The nematodes extracted were killed and fixed by using FAG, heated to 80%, then mounted in pure glycerine to make slides for microscopic observation according to Hooper (1970). Photographs and measurement was

taken by Phase contrast microscope. The identification was done with the help of taxonomic keys defined by Mai and Lyon 1975.

Two dominant genera i.e. *Hoplolaimus indicus* and *Helicotylenchus dihystera were selected.*

Results

Identified the plant parasitic nematodes with their systematic position. Nematodes identified belonged to the *Tylenchidae* and they were under two families viz, *Hoplolaimidae and Helicotylendae*. The distribution revealed a general trend of high population during the winters at relatively lower temperature. On the basis of taxonomic key four species of *Hoplolaimus* and two species of *Helicotylenchus were observed.*

***Hoplolaimus indicus* Daday, 1905, (fig-1)**

Female: large sized (1-6mm), lip region high, offset, with prominent transverse and longitudinal striae (except H. cephalus. Stylet massive (30-61µm). Basal knobs tulip-shaped. Esophageal gland with six nuclei. Excretory pore anterior to oesophago-intestinal junction. Intestine overlapping rectum. Vulva median. Tail short terminus hemispherical to bluntly rounded, annulated. *Male:* slightly smaller in size, tail short, spicules well developed, Arcuate with distal flanges (variable in size). Spermateca filled with sperms. Bursa extending to tail tip, gubernaculum large protrusible with titillate and telamon.

Genus- ***Helicotylenchus di hystera*** *(fig.-2)*

Female: large sized (.69mm), Body spiral. Cuticle with distinct transverse striae. Lip region continuous with body, hemispherical bearing 4-5 annules. Oesophagus with overlapping glands, longest overlap ventral. Both genital branches equally developed. Tail dorsally convex-conoid, usually with slight ventral projection. Male extremely rare.*H.dihystera* is a cosmopolitan and most widely distributed species of the genus associated with various host plants. (Measurements Table-1).

Discussion

The results indicated a significant population of plant parasitic nematodes on the different soil textures. The highest population of nematodes was found in areas having sandy soil and lowest population was found in the cane field having clayes soils. Plant parasitic nematodes have been reported to constitute serious impediments to sugarcane production in various parts of the world (Anwar *et al*, 1986). In the present investigation, *Hoplolaimus spp* (lance nematode) and *Helicotylenchus* spp. (spiral nematode) were the most frequently occurring species in the soil and root sample. Of these, once

nematode, *Hoplolaimus* spp. is the most predominant and economically important genus. This nematode is widely prevalent in both subtropical and tropical regions and reduces yield and quality of cane in both light and heavy soil types. It causes root rotting and reduces uptake of water and soil nutrients. The symptoms are general lack of vigor, discoloration of foliage, and stunted plants (Hall and Irey, 1992). Plant-parasitic nematodes damage is an important factor in tuber quality reduction and yield loss in sugarcanes both in the field and in storage. Sugarcanes are vulnerable to nematode damage as they reduce the yield and quality of the tubers as a result of root gallings, root lesions, dry and soft rots depending on the type of plant parasitic nematodes. Nandwan *et al.*, (2005) reported the community analysis of phytonematodes in the sugarcane ecosystem in Bundi district of Rajasthan. Prakash *et al*; (2009) reported on collection and distribution frequency of plant-parasitic nematodes associated with sugarcane in Uttar Pradesh. In Meerut region Chaubey and Satyendra (2010) have studied the prevalence and management of different species of *Meloidogyne* spp. Padma Bohra (2012) has studied on twelve species of nematodes: new records for India. The presence of plant parasitic nematodes could constitute serious impediments to the growth and yield of sugarcanes in Meerut regions of U.P. State.

The plant parasitic nematodes species associated with the soil and roots of sugarcane in Meerut district. *Hoplolaimus* and *Helicotylenchus* species during growing season were above the threshold level at many locations although population levels of other plant parasitic nematodes were below economic or damaging levels. There is a need to educate local farmers on the large diversity of plant parasitic nematodes associated with sugarcane their damage potentials by creative awareness programmes. In view of the above aspect, the present study was under taken to evaluate the distribution and prevalence of different species of plant parasitic nematodes in Meerut.

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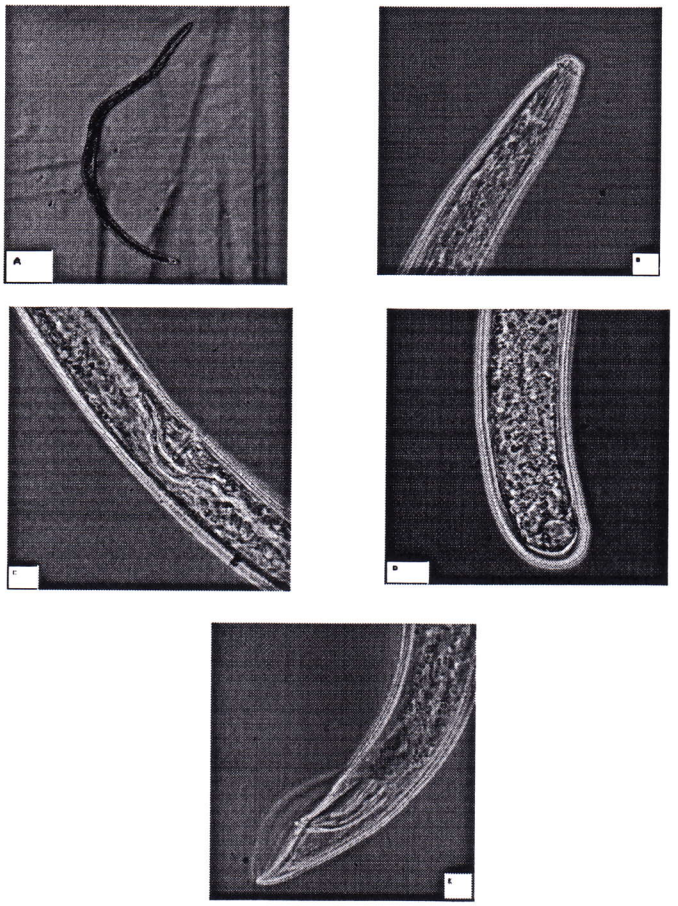

Fig. 1 A- Whole mount of *Hoplolaimus indicus* B-anterior end C- vulva region D- Female tail region E- Mail tail region *(Hoplolaimus spp)*.

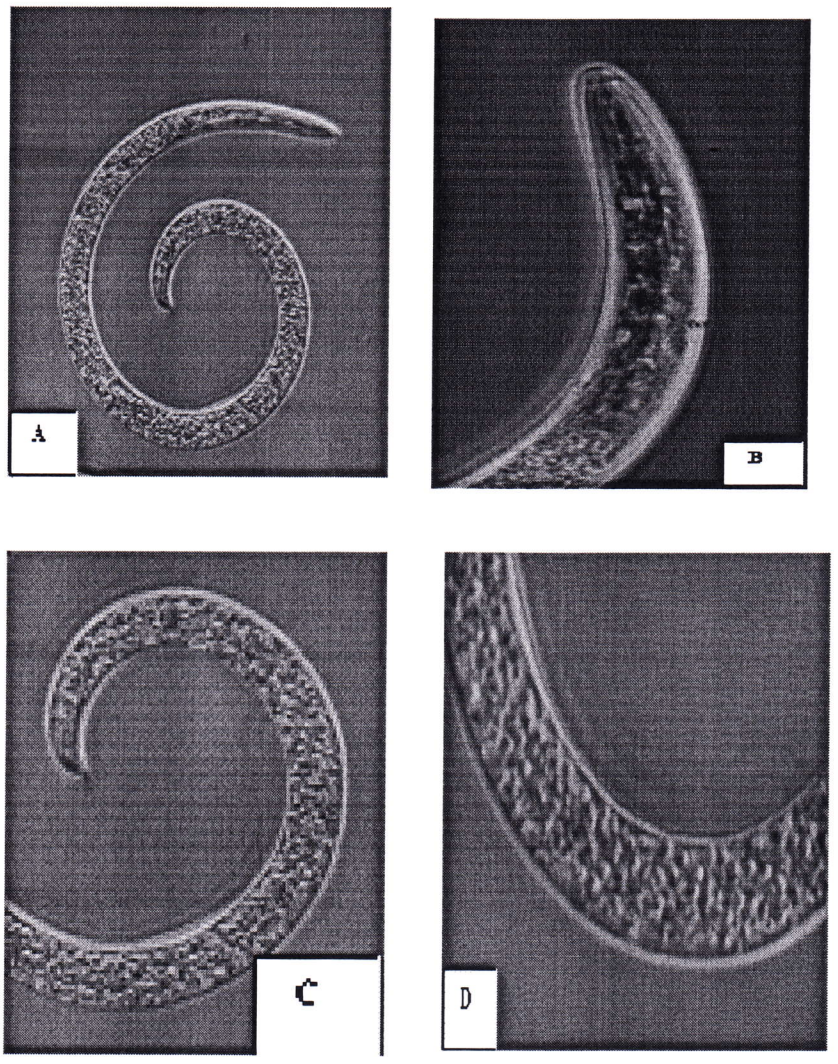

Fig 2, A-whole mount of *Helicotylenchus dihystera*, B-Anterior region of spp, C- Tail region, D -Median region of spp.