International Journal of Zoology and Applied Biosciences **ISSN: 2455-9571**
Volume 6, Issue 2, pp: 98-103, 2021
https://doi.org/10.5281/zenodo.4905363
http://www.ijzab.com

Research Article

MORPHOLOGICAL OBSERVATIONS ON *Helicotylenchus crenacauda* Sher, 1966 ASSOCIATED WITH BANANA PLANTATIONS IN NORTH 24-PARGANAS DISTRICT, WEST BENGAL, INDIA

[1]*K. Haldar, [2]V.V. Gantait and [1]A.N. Rizvi

[1]Nemathelminthes Section, Zoological Survey of India, M-Block, New Alipore, Kolkata-700053, West Bengal, India

[2]Ecology Section, Zoological Survey of India, M-Block, New Alipore, Kolkata-700053, West Bengal, India

Article History: Received 12th April 2021; Accepted 25th April 2021; Published 30th April 2021

ABSTRACT

Observations were made on the variation in shape of crenate, present in the tail region, the main identifying character of *Helicotylenchus crenacauda* Sher, 1966 collected from the banana plantations in North 24-Parganas district of West Bengal. The changes in shape were also studied by Scanning Electron Microscopy. Molting stage of the species was observed particularly in pre-monsoon season. The month wise variation in different edaphic factors during the period was noted and graphically presented.

Keywords: *Helicotylenchus crenacauda*, Crenate variation, Molting, Banana, West Bengal.

INTRODUCTION

The spiral shaped plant parasitic nematodes, belonging to the genus *Helicotylenchus* was established by Steiner, 1945. The genus is a widely distributed group having global existence in agricultural and non-agricultural soils; about 230 valid nominal species are reported worldwide (Uzma *et al*., 2015). Due to the large number of species and displaying intraspecific variation in some characters, it is difficult to identify species of *Helicotylenchus* (Fortuner *et al*., 1981; Fortuner, 1984a&b; Marais, 2001. Lal & Khan, (1993) opined that amongst the Indian species of the genus, about 33 percent share a common character of the tail having a terminal projection. *Helicotylenchus crenacauda* Sher, 1966 is distinctly different from other species of the genus having a peg-like projection at their tail region, known as crenate. *H. crenacauda* was found to be one of the most abundant nematode from the rhizophere of banana during the surveys conducted to North 24-Parganas District of West Bengal. Amongst 22 block of the district surveyed, Bangaon specimens showed maximum variation in the shape of crenate in the tail region (Figure 1).

Molting is an essential developmental process of life cycle for majority of animal group *viz.* insects, arachnids, crustaceans, nematodes and others Lazetic & Fay (2017). In case of nematodes very little is known about the process. Though shedding of the cuticles in plant parasitic nematodes have been described in some cases, their molting has not been examined except in very few (Fisher, 1966; Rhoades & Linford, 1961; Van Gundy, 1959). During the present study molting of *H. crenacauda* was observed in some nematode specimens during pre-monsoon season (May, 2016). The edaphic factors recorded at that time are represented here. The morphological variations observed in *H. crenacauda* tail region are discussed and supported with Scanning Electron Microscope (SEM) photomicrographs.

MATERIALS AND METHODS

Soil sampling was done within rhizospheric soil of banana in North 24-Parganas District of West Bengal, from January

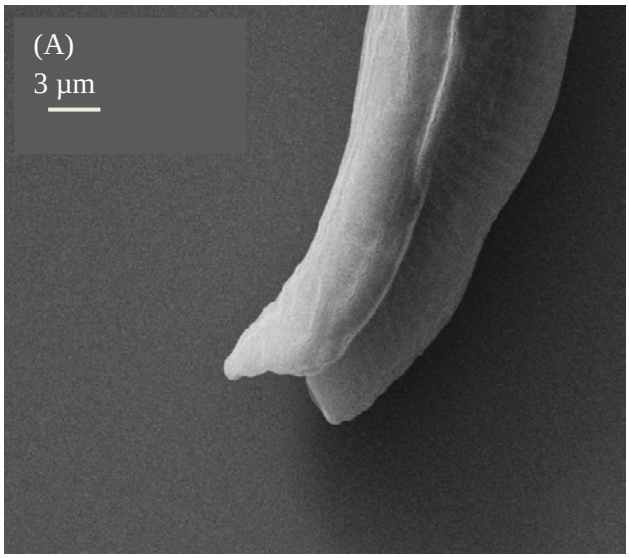
*Corresponding Author: Mrs. K. Haldar, Senior Research Fellow, Nemathelminthes Section, Zoological Survey of India, M-Block, New Alipore,Kolkata-700053, West Bengal, India, Email: keya1haldar@gmail.com

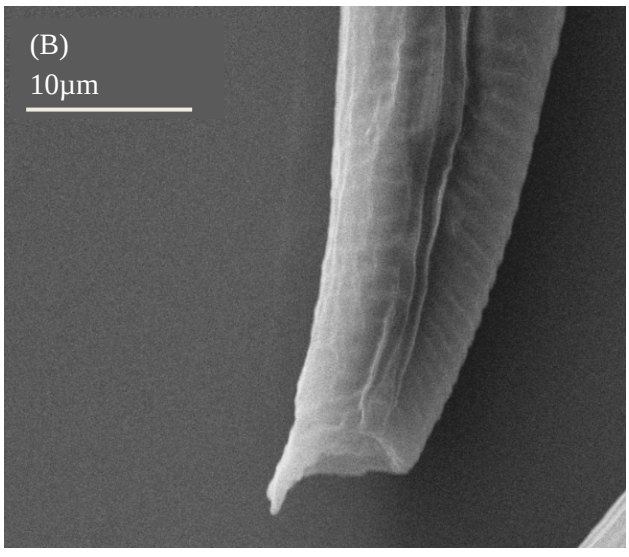
to December 2016. Soil samples of about 250 grams were collected from rhizospheric zone of banana plantations (*Musa paradisiacal* L. *cv.* Kanchakala) at Bangaon Block (23.0438ºN, 88.8284ºE) in North 24-Parganas.The samples were collected every month. Nematodes specimens were extracted from samples by using Cobb's sieving and decanting method (Cobb, 1918) followed by modified Baermann's funnel technique (Christie & Perry, 1951). Nematodes were processed by Seinhorst's slow dehydration method (Seinhorst, 1959) and mounted in anhydrous glycerin. Specimens were identified and photomicrographs were taken with Olympus research microscope (Model No. BX53DIC with DP27 camera).The SEM has been done by using ZEISS Scanning Electron Microscope, Model no. EGO18. The specimens were deposited in the National Zoological Collections of Zoological Survey of India, Kolkata of West Bengal, India with the registration numbers (WN 3020/1 and WN 3020/2).

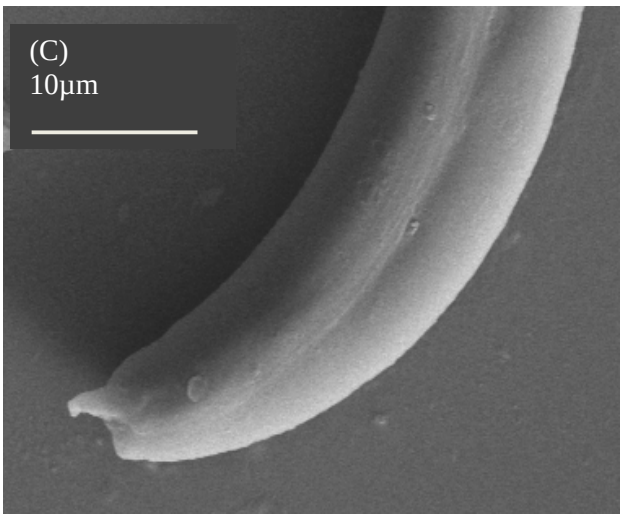
RESULTS AND DISCUSSION

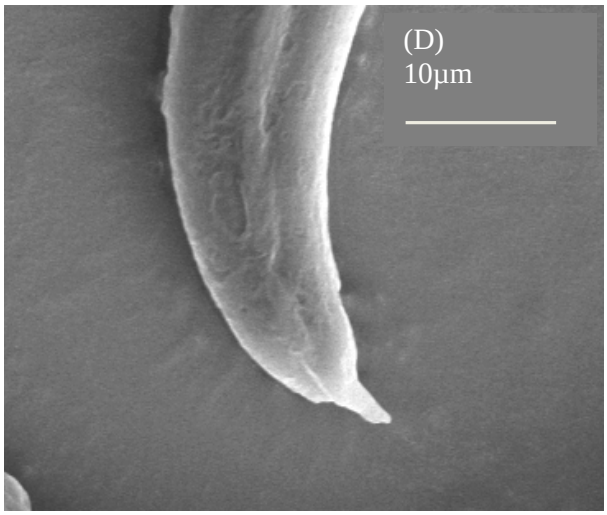
In case of genus *Helicotylenchus* the most variable criterion was the shape of tail (Fortuner, 1979). The crenate, most important identifying character of *H. crenacauda* shows maximum variability in shape. During the present study, 5 types of morphologically variable crenate structures were considered in *H. crenacauda* from different blocks of North 24 Parganas district. Morphological variations in *H. crenacauda* representing female specimens from the study area demonstrated that they have the same general features *viz.* spiral body, body length, more or less hemispherical lip region, stylet length of 22-28 µm, V- value of 59-64%. They are also closely identical in shape of stylet-knobs, oval-shaped median oesophageal bulb, hemizoid and excretory pore anterior to oesophago-intestinal junction in position. However, the tail shape along with its related features like length, thickness, curvature of ventral side etc. showed variability. The difference present in the cuticular fold in tail in the female of *H. crenacauda* might be due to different geological factors of these blocks and hence is considered as intraspecific variability.

Intraspecific variability in tail shape of tylenchid nematodes have been studied in different genera e.g. *Cylindrocorpus* Chin, 1975; *Xiphinema* Luc & Hunt, 1978; *Paratylenchus* Geraert, 1965 and *Pratylenchus* Taylor & Jenkins, 1957. The variation in tail shape among different species of *Helicotylenchus* was also studied by different authors like Anderson, 1974; Sher, 1966; Siddiqi, 1972 and Van den Berg & Heyns, 1975 etc. Fortuner (1979) studied on wide range of tail shapes in female of different closely related species of *Helicotylenchus viz. H. dihystera* Siddiqi, 1972; *H. caribensis* Roman, 1965; *H. digonicus* Perry, 1959; *H. paraconcavus* Rashid & Khan, 1974; *H. aerolatus* Van den Berg & Heyns, 1975; *H. flatus* Roman, 1965; *H. borinquensis* Roman, 1965; *H. glisus* Thorne & Malek, 1968; *H. bambesae* Elmiligy, 1970; *H. talonus* Siddiqi, 1972 and *H. pseudorobustus* (Steiner, 1914) Golden, 1956. After the study, he strongly suggested that variations in tail shape should not be used for differentiating between most of the species of the genus. But it might be used for comparing closely related described species of the genus to ascertain their involvement.









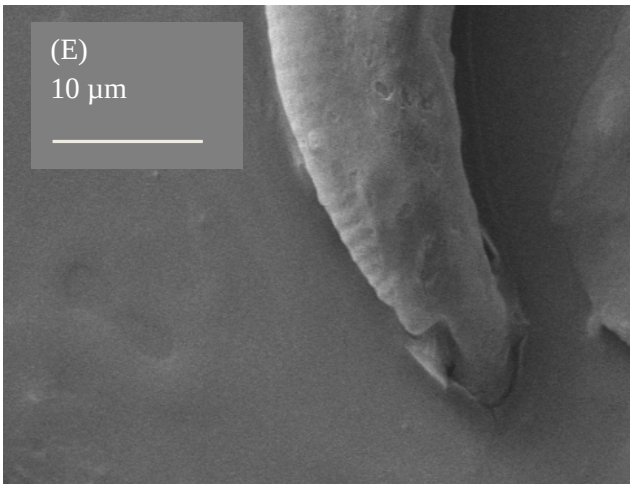


Figure 1. (A-E): Morphological variation in crenate structure of *Helicotylenchus crenacauda* Sher, 1966.

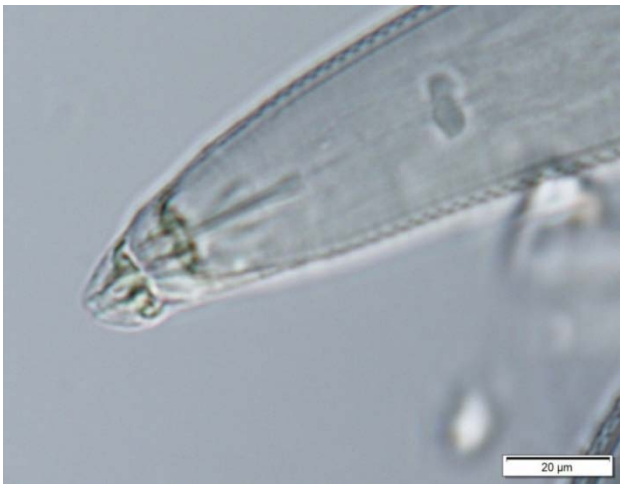


Figure 2. Molting of *Helicotylenchus crenacauda* Sher, 1966.

The molting is an important process for the development of anatomical structures and growth of adult stage. It occurs at intervals during the process of life cycles of nematodes. A few observations on molting process were done in case of free-living and plant parasitic nematodes. Watson (1962) studied molting in the free living nematode *Turbatrixaceti.* Coomans & De Coninck (1963) studied on *Xiphinema* and in Aporcelaimids by Coomans & van der Heiden, (1971). Grootaert & Lippens (1974) observed on molting in *Aporcelaimellus*. The process is also observed in very few cases of plant parasitic nematodes. Shedding of cuticle has been described by van Gundy (1959) and Rhoades & Linford (1961). Bird & Rogers (1965) studied molting in *Meloidogyne javanica*. Fisher (1966) studied on *Pratylenchus nanus.* For most of the plant parasitic nematodes the initial factors related to the process is not completely known but it regulated by combination of genetic and environmental factors (Lazetic & Fay, 2017). During the present observation in *H. crenacauda* the stimulus for molting operates as a trigger mechanism towards the anterior part of cuticle and sheded separately from head region (Figure 2). The environmental factors like temperature, moisture and pH may have some influence on this process. The graphical representation of seasonal variation of these factors is presented (Figure 3). Significantly, the nematode specimens collected between April-May goes through the molting stages. But during other periods, the process is not shown by the specimens. During this time temperature ranges between 30.5-35.0ºC, pH 5.5-6.0 and moisture varies from 2.5 to 3 respectively. Fisher (1966) opined that the optimum temperature for molting in nematodes is about 20ºC. In present study the temperature between30.5-35.0ºC also supports this process. (Hale, 1958) observed the effect of pH on molting which ranges from 4 to 8. In present study pH varied 5.5-6.0.

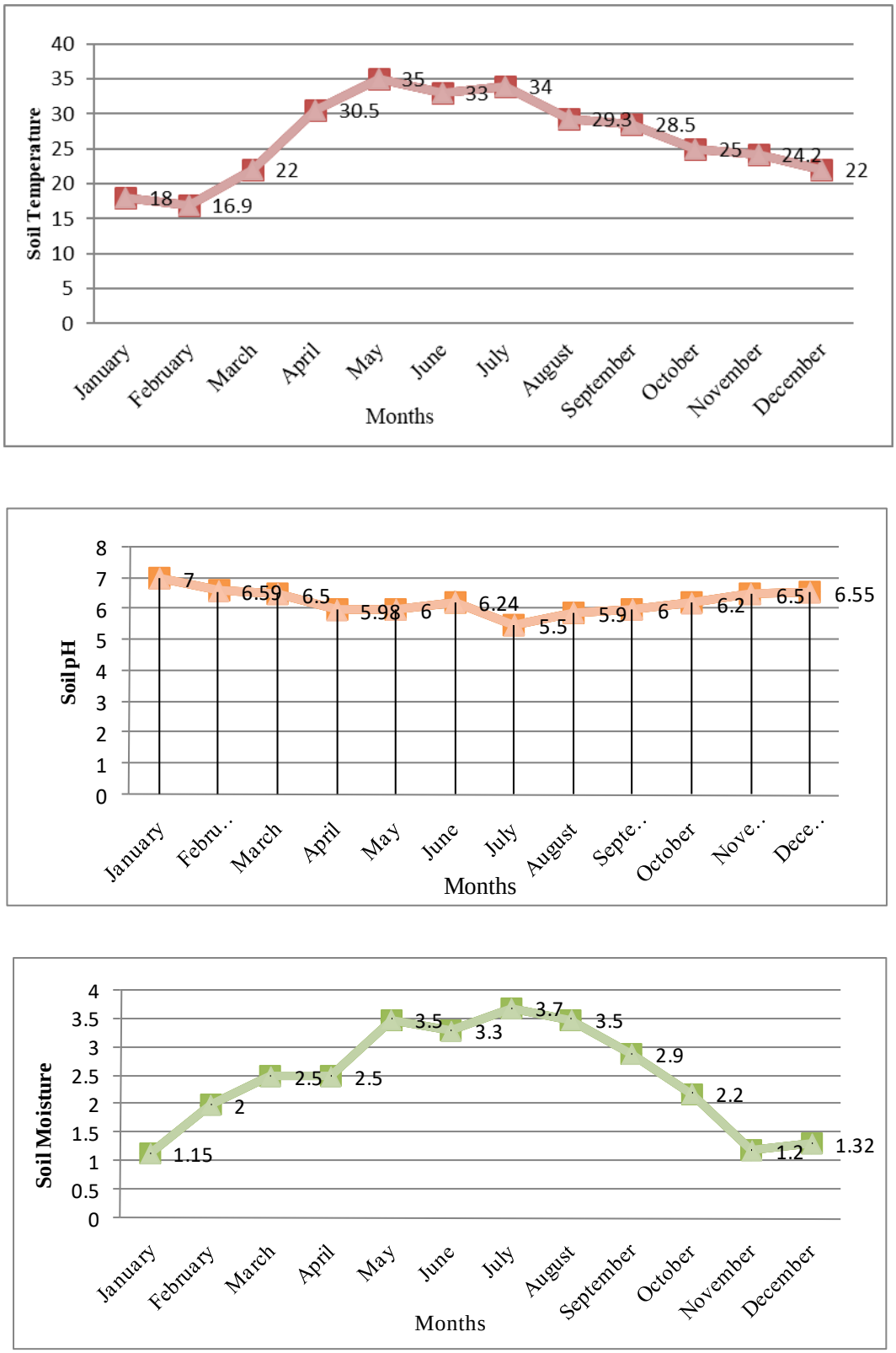


Figure 3. Monthly variation of edaphic factors (Temperature, pH and Moisture) from January to December, 2016.

CONCLUSION

Variations in different body structures have some taxonomic importance for identifying different groups of animals. Morphological identification of spiral nematodes of the genus *Helicotylenchu*s is a difficult task as most of their diagnostic characters vary within the species. The shape of tail is an important criterion for identification of new *Helicotylenchu*s species. Variations in crenate in *H. crenacauda* also help to highlight the intraspecific variation in this species. Molting allows the replacement of cuticle thereby enabling growth or developmental specialization. This process may be a potential focus to control the nematodes, infectious to plants by adopting some control measures. Though a clear and integrated description of this process is still missing or not so clear in case of nematodes, further studies will help to a better understanding of this important developmental process mainly in plant parasitic nematodes.

ACKNOWLEDGEMENT

We are grateful to Dr. Kailash Chandra, the Director, Zoological Survey of India, Kolkata, for encouragements and support. Sincere thanks to Vice Chancellor, West Bengal State University, Barasat, North 24-Paganas, West Bengal by the first author for providing essential support to prepare the paper.

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