



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2020; 8(6): 1107-1109

© 2020 JEZS

Received: 09-09-2020

Accepted: 21-10-2020

Venkadesh GM.Sc. Scholar, Department of
Nematology, Assam Agricultural
University: Jorhat, Assam, India**Debanand Das**Principal Scientist, Department
of Nematology, Assam
Agricultural University: Jorhat,
Assam, India**Binita Basumatary**Ph. D Scholar, Department of
Nematology, Assam Agricultural
University: Jorhat, Assam, India**BN Choudhury**Professor and Head,
Department of Nematology,
Assam Agricultural University:
Jorhat, Assam, India**Corresponding Author:****Venkadesh G**M. Sc Scholar, Department of
Nematology, Assam Agricultural
University: Jorhat, Assam, India

Trichodorus borai Rahman, Jairajpuri and Ahmad, 1985 from banana: A first report from Assam

Venkadesh G, Debanand Das, Binita Basumatary and BN Choudhury

DOI: <https://doi.org/10.22271/j.ento.2020.v8.i6o.7984>

Abstract

In the survey of plant parasitic nematodes conducted during 2019-20 at Lakhimpur region of Assam, the stubby root nematode, *Trichodorus borai* Rahman, Jairajpuri and Ahmad, 1985 was found around the rhizosphere of banana. Females, males and juveniles of *Trichodorus borai* were observed from the soil samples after processing and extraction. This population was morphologically and morphometrically analyzed and compared with the original description, and confirmed to be the *Trichodorus borai*. This was the first report of occurrence of *Trichodorus borai* around the rhizosphere of banana from Assam.

Keywords: *Trichodorus borai*, banana nematodes, descriptions, Assam

Introduction

Plant parasitic nematodes are one of the major constraints for successful cultivation of banana. Loss in crop yield due to plant parasitic nematodes depends on the crop (variety) and the nematode species present. Nematodes attack root and corm tissue of banana, causing reduced bunch size, shorten production life, prolong the vegetative cycle, and ultimately reduces the yield. Many a time their attack leads the plants to topple by wind. Burrowing and spiral nematodes are reportedly responsible for yield losses of 30–50 percent in Costa Rica and Panama, 40 percent in Africa, 30–60 percent in India ^[1] and more than 50 percent in East Africa ^[2, 3]. In India yield loss of banana due to infestation of *Pratylenchus coffea* was recorded to be 44.4 percent ^[4] while, yield loss due to *Radopholus similis* was 31-41 percent ^[5] and *Meloidogyne incognita* was 30.9 percent ^[6], respectively. Out of 132 species of nematodes reported to be associated around banana plantation, 71 species (belonging to 33 genera) had been reported from India ^[7]. However, *Radopholus similis*, *Pratylenchus* spp. and *Meloidogyne incognita* are economically important nematode pests of banana. *Helicotylenchus multicinctus*, *H. dihystra*, *Heterodera oryzicola* and *Rotylenchulus reniformis* are also having some regional importance in banana plantations. *Helicotylenchus dihystra*, *Meloidogyne incognita*, *Pratylenchus thornei*, *Pratylenchus musii*, *Rotylenchulus reniformis*, *Tylenchorhynchus leviterminalis*, *Macroposthonia* spp., *Psilenchus* sp., *Cephalenchus leptus*, *Hemicycliophora mangiferae*, *Xiphinema radicolica*, *Hoplolaimus indicus* and *Longidorus* sp. have already been reported from Assam around banana rhizosphere ^[8, 9].

Materials and Methods

Soil as well as root samples were collected during 2019-20 from around the rhizosphere of banana to study the diversity of plant parasitic nematodes associated with banana plantations. Soil was collected from around the root zone of banana plantation from about 30-45 cm depth. A total of 10-15 sub-samples made one composite sample. Soil samples were processed following Cobb's modified sieving and decanting technique ^[10] for extraction of nematodes. Extracted nematodes in water were observed under stereozoom binocular microscope for primary identification of nematodes. During observation, population of *Trichodorus* was observed in the samples collected from Dhemaji district of Assam. Presence of *Trichodorus* around the rhizosphere of banana plantation is the first report from India. The nematodes were picked separately, processed in Seinhorst method ^[11] for clearing the nematodes for better observation. Cleared nematodes were mounted on laboratory slides (75 X 26 mm) in anhydrous glycerin and measured under Zeiss Axiostar plus trinocular research microscope using an ocular micrometer calibrated to a stage micrometer.

De Man's formulae [12] were used and compared with the available species description under this genus for identification of nematodes up to species level.

Results and Discussion

Males* (n=20): L= 0.650 mm \pm 0.068 (0.509-0.778 mm), a= 23.39 \pm 2.66 (17.60-28.80) b= 5.16 \pm 0.52 (4.13-5.80), b'= 4.98 \pm 0.43 (4.10-5.63), c= 56.79 \pm 9.33 (41.42-75.37), c'= 0.69 \pm 0.14 (0.50-1.06), Onchiostylet=52.80 μ m \pm 1.74 (50.00-57.00 μ m), Oesophagus= 130.66 μ m \pm 0.350 (129-138 μ m), nerve ring = 74.27 μ m \pm 4.04 (67.00-82.00 μ m), spicule= 31.60 μ m \pm 2.26 (28.00-38.00 μ m), Vms 1 to 2= 28.31 μ m \pm 7.16 (19.00-41.00 μ m), Vms 2 to 3= 16.50 μ m \pm 3.99 (9.00-25.00 μ m), Vms 3 to anus = 20.75 μ m \pm 6.38 (13.00-42.00 μ m), Cp from anterior end = 46.84 μ m \pm 7.57 (38.00-65.00 μ m)

Females* (n=20): L= 0.625 mm \pm 0.056 (0.547-0.740 mm), a= 21.42 \pm 2.37(17.53-25.71), b= 5.11 \pm 0.55 (4.19-6.20), c= 101.65 \pm 20.30 (73.75-162.75), c'= 0.46 \pm 0.08 (0.30-0.57), V= 56.21 \pm 2.35 (52.07-60.74), G₁= 19.07 \pm 2.17(15.19-23.35), G₂= 18.00 \pm 2.44 (12.70-22.43), Onchiostylet = 52.46 μ m \pm 3.02 (45.08-56.84 μ m)

*Mean \pm SD; (Range)

Descriptions: Male: Body ventrally curved with greater curvature in posterior part, tapering gradually from middle of the oesophagus to anterior end. Cuticle in three layers, inner cuticle finely striated, 2-3 μ m thick on mid body and about 5 μ m on tail. Lip region continuous with the body, about 8.87 μ m (6.86 - 12.74 μ m) width and 4.21 μ m (2.94 - 4.90 μ m) high. Labial papillae slightly raised. Amphids vase shaped with ellipsoidal apertures, 3-4 μ m wide. Stoma tubular, about 18-20 μ m long. Onchiostylet (Plate 1A) slender, 50.00 - 57.00 μ m long. Oesophagus (Plate 1B) slender, basal bulb pyriform, 13 - 14 μ m wide, abutting. A ventromedian cervical papillae (Plate 1A) opposite posterior half of the onchiostylet, 38.00 - 65.00 μ m from the anterior end. Nerve ring at 67.00-82.00 μ m from the anterior end. Excretory pore at the vicinity of the nerve ring.

Spicule arcuate, broader anteriorly, gradually narrowing to a pointed tip. Gubernaculum 12 μ m, thin and long with a thickening at the distal end. Cuticular muscles attached to the head of the spicules. Ventromedian supplements three (Plate 1C), almost equally apart. Tail end rounded.

Female: Similar to male, except having no cervical papillae and ventromedian supplements. Vulva indistinct, irregular pore like, around at mid body (56.21%). Vagina around half way across the body, two irregular sclerotized pieces present at vulva-vagina junction (Plate 1D). Spermatheca rounded (Plate 1E), with sperms. Rectum 13-16 μ m long. Anal opening sub-terminal (Plate 1F) with a faint caudal pore.

The present population of *Trichodorus* from banana confirms well with the dimensions and descriptions of *Trichodorus borai* given by the Rahman, Jairajpuri and Ahmad, 1985 however, present population differ from the original description on being longer in size, having shorter tail and longer onchiostylet and oesophagus in both male and female (male: L= 0.49-0.60 mm, c= 47-60, onchiostylet= 48-51 μ m, oesophagus= 125 μ m; female= L=0.54-0.63, c= 91-122, onchiostylet= 46-51 μ m, oesophagus= 118-134 μ m in original description).

Trichodorus, commonly known as stubby root nematodes belongs to the family Trichodoridae, Thorne, 1935. They are polyphagous in nature and have worldwide distribution [13].

They are generally root ectoparasite of plants however, a species of *Trichodorus* has been reported from thrips (*Caliothrips* sp.; Thysanoptera: Panchaetothripinae) [14]. This group of nematodes received worldwide attention during 1951 when Christei and Perry reported that *Trichodorus christei* is pathogenic to vegetable crops (e.g. bean, celery, cowpea, pea, pepper, tomato, etc.) in Florida. The Trichodorid nematode possesses a long stylet, called an onchiostyle, with which they pierce epidermal cells of plant root, preferentially the meristematic tissues near the tip of the growing root. This action leads to abnormally stunted roots, caused due to cessation of root elongation and an overall reduction in root development. This condition of root system is descriptively called "stubby root", and this group of nematodes as "stubby root" nematodes. They have wide host ranges of crops as well as natural vegetation. Moreover, this group is responsible for transmission of plant pathogenic viruses like tobacco rattle virus, pepper ring spot virus, pea early browning virus.

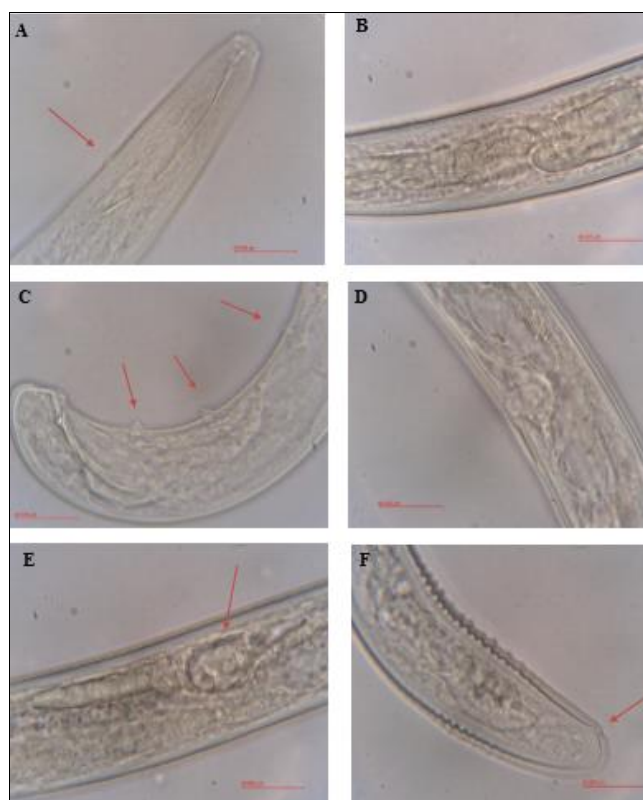


Plate 1: (A-F). Microphotographs of *Trichodorus borai* (10 X 100x) (Scale bars are represented by 20 micro meter given in each photographs)

A. Anterior head region- Male with onchiostylet and ventromedian cervical papillae (arrow), B. Oesophageal region, C. Male tail with ventromedian supplements 3 nos (arrows), D. Vulval region, E. Female gonad with Spermatheca (arrow) and F. Posterior region with anus (arrow).

Conclusion

The present study represents the first report on the occurrence of *Trichodorus borai* Rahman, Jairajpuri and Ahmad, 1985 from around the rhizosphere of banana from Assam. Studies on this nematode will be helpful for taxonomic research, host range studies and virus transmission in Banana in the future.

Acknowledgements

The authors are greatly thankful to the AICRP on Nematodes in Agriculture and Directorate of Research (Agriculture),

Assam Agricultural University, Jorhat for providing necessary facilities and support for conducting this research successfully.

References

1. Davide RG. Overview of nematodes as a limiting factor in *Musa* production. In: *New Frontiers in Resistance Breeding for Nematode, Fusarium and Sigatoka*, October 1995, Kuala Lumpur, Malaysia. Frison EA, Horry JP, De Waele D. (Eds.). INIBAP, Montpellier, France 1996;2-5:27-31.
2. Speijer PR, Kajumba C. Yield loss from plant parasitic nematodes in East African highland banana (*Musa AAA*). *Musafrica* 1996;10:26.
3. Kashaija IN, McIntyre BD, Ssali H, Kizito F. Spatial distribution of roots, nematode populations and root necrosis in highland banana in Uganda. *Nematology* 2004;6(1):7-12.
4. Sundararaju P, Shanthi A, Sathiamoorthy S. Status report on *Musa* nematode problems and their management in India. *Towards management of Musa nematodes in Asia and the Pacific*, 2003, 21.
5. Koshy PK, Nair CPR. Control of *Radopholus similis* (Cobb, 1893) Thorne, 1949 in coconut nursery. *Indian Journal of Nematology* 1979;9(1):15-19.
6. Jonathan EI, Rajendran G. Assessment of avoidable yield loss in banana due to root-knot nematode *Meloidogyne incognita*. *Indian Journal of Nematology* 2000;30(2):162-164.
7. Sunderaraju P, Shanthi A, Sathiamoorthy S. Status report of *Musa* nematode problems and their management in India. In: *Towards management of Musa nematodes in Asia and the Pacific*. University of the Philippines Los Baños Laguna, Philippines, 1-5 December 2003, Dela Cruz Jr. S, Van den Bergh I, De Waele D, Hautea DM, Molina AB. (Eds.), 2005, 21-42.
8. Debanand D, Alpana D, Kartik B. Diversity of plant parasitic nematodes in banana at ten districts of Assam. *Indian Journal of Nematology* 2013;43(1):102-104.
9. Alpana D, Debanand D, Kshetrimayum S. Nematode community around banana rhizosphere in Jorhat district of Assam. *Indian Journal of Nematology* 2014;44(2):252-254.
10. Christie JR, Perry VG. Removing nematodes from soil. *Proceedings of the Helminthological Society of Washington* 1951;18(2):106-108.
11. Seinhorst JW. A rapid method for the transfer of nematodes from fixative to anhydrous glycerin. *Nematologica* 1959;4(1):67-69.
12. De Man JG. Die einheimischen, frei in der reinen Erde und im süßen Wasser lebenden Nematoden. Vorläufiger Bericht und descriptiv-systematischer Theil. *Tijdschrift der Nederlansche Dierkundige Vereeniging* 1880;5:1-104.
13. Decraemer W, Robbins RT. The who, what and where of Longidoridae and Trichodoridae. *Journal of Nematology* 2007;39(4):295.
14. Carta LK, Skantar AM. A *Trichodorus* (Triplonchida: Trichodoridae) Nematode from Thrips (Thysanoptera: Panchaethripinae). *Journal of Nematology* 2014;46(3):302-308.