



Available Online at EScience Press

## Plant Protection

 ISSN: 2617-1287 (Online), 2617-1279 (Print)  
<http://esciencepress.net/journals/PP>

### DESCRIPTION OF *PRATYLENCHUS SIDDIQI* N. SP. FROM BANANA (*MUSA ACUMINATA* L.) MALIR CANTT, KARACHI, SINDH, PAKISTAN

**Nasir Mehmood, Tabassum Ara Khanum**
*National Nematological Research Centre, University of Karachi, Karachi-Pakistan*

#### ARTICLE INFO

##### Article history

*Received: 11<sup>th</sup> July, 2021*
*Revised: 17<sup>th</sup> August, 2021*
*Accepted: 21<sup>st</sup> August, 2021*

##### Keywords

*Nematode*
*Plant parasitic*
*Banana (*Musa acuminata*)*
*Taxonomy*

#### ABSTRACT

During the surveys for isolation of plant and soil nematodes from different fruit of Sindh and Balochistan, different plant and soil nematodes were found. The new species was captured from banana (*Musa acuminata* L.) vegetation at Malir Cantt. Karachi, Sindh. Soil sample analysis revealed that the new species of plant parasitic nematode, *Pratylenchus siddiqi* n. sp. It is characterized by body posture irregularly curved after fixation, lateral field with six incisures, 2 annuli in the cephalic region, stylet = 15-16  $\mu$ m long, V%= 71-78, tail sub-cylindrical to conoid with smooth terminus and the absence of males. Present paper deals with detailed taxonomical studies of new species with measurements, descriptions, illustrations and microphotographs.

*Corresponding Author: Tabassum Ara Khanum*
*Email: tabassumak@uok.edu.pk*
*© 2021 EScience Press. All rights reserved.*

#### INTRODUCTION

Banana (*Musa acuminata* L.) is the economically most essential crop of Pakistan. Effective development in the agronomic production depends on proper crop protection from pests and diseases. Amongst these, the problem of nematodes in agricultural production is of significant importance. These unseen pests cause huge losses to the farm revenue by way of reduced yield as well as the quality of the production. Nematodes as phyto-parasites play relatively destructive role and cause an average damage of up to 20% or even complete crop loss if together with other pathogens. At yet, only 3% of nematodes species have been taken and recognized or described. Nematodes are a diverse group of round worms which are found widely throughout the world in almost every surroundings. From Pakistan, numerous surveys were organized to isolate the nematode genera associated with many commercial crops and the damages through nematodes on those

crops. There are many microorganisms which are associated with fruit crop. Nematode parasites are the most severe threat to fruit crops and they cause heavy losses to farmers along with agriculture sector. One gram of soil may contain the nematodes having diverse taxonomic groups. The most prevalent and damaging nematodes on banana were found *Helicotylenchus dihystra*, *H. multicinctus*, *Hemicriconemoides mangiferae*, *Hoplolaimus columbus*, *H. indicus*, *H. pararobustus*, *Pratylenchus goodeyi*, *Pratylenchus zae*, *Meloidogyne javanica*, *M. incognita*, *Radopholus similis*, *Rotylenchulus reniformis* (Zarina and Shahina, 2013). Extensive surveys of different cereals, vegetables, fruits and economically important crops from all provinces were carried out to determine the presence and damages from nematodes. As a result of these investigations the nematode fauna of Pakistan that has been determined so far, includes 765 species (242 new and 523 new record), belongs to 263 genera, 82

subfamilies, 87 families, 24 super families, 19 suborder, 12 orders and 2 classes (Shahina et al., 2019).

Sindh has a subtropical climate and great agrarian lands for culturing new crops. The distinctive climatic situations in Sindh provinces provide an excessive range and variability for fruit manufacturing. Banana (*Musa acuminata* L.) is mostly cultivated in the tropical and subtropical regions. It is soft edible fruit with soft flesh, rich in stretch, and seed less pulp. During the current study, three new species and one new record were found from fruit viz. *Paratylenchus manilkarii* (Iqbal et al., 2020) from chickoo (*Manilkara zapota*) at Hub Lasbela, Balochistan and *Paratylenchus sindhicus* (Iqbal et al., 2020) from Gadab whereas *Pratylenchus kralli* Rass, 1982 also from Gadab, Sindh. Present paper deals with morphology, illustration, and morphometrics of the new species of the genus *Pratylenchus* (Filipjev, 1936).

#### MATERIALS AND METHODS

During the present study a total of 20 soil and root samples of banana (*Musa acuminata* L.) vegetation were taken from Malir Cantt. Karachi, Sindh. The samples were placed in polythene bags and sealed tightly with a rubber band with relevant information including date of collection, locality, and crop detail was mentioned on each bag. Soil and root samples were processed by the methods of Cobb (1918) and Baermann (1917) funnel method. After qualitative and

quantitative analysis of nematodes process of killing, fixing, and slow dehydration were done for permanent slide mounts (Hooper et al., 2005). Identification of nematodes was made through measurements given by De Man (1880) formula with an ocular micrometer under a compound microscope and identification was based on the systematics given by Siddiqi (2000). Illustrations were prepared with the help of a drawing tube attached to the compound microscope and photographed of nematodes were made with a Nikon DS, Film camera, attached to the same Nikon Eclipse E400 microscope.

#### RESULT AND DISCUSSION

***Pratylenchus siddiqi* n. sp.** (Figure 1, 2 and Table 1)

##### Description

**Female:** Body vermiform with irregularly curved after fixation. Head low, bearing 2 annules. Body cuticle finely annulated, about 1  $\mu\text{m}$  wide near mid body. Lateral field about 1/3 of body width, in esophagus-vulva region with 6 incisures. Cephalic framework heavily sclerotized. Stylet strongly developed, the metanchium slightly shorter than telanchium. Basal stylet knobs with flattened to concave anterior surface 3-5  $\mu\text{m}$  across and 2-2.4  $\mu\text{m}$  high. Orifice of dorsal oesophageal gland 3-4  $\mu\text{m}$  behind stylet base. Median esophageal bulb 12-13  $\mu\text{m}$  long x 9-10  $\mu\text{m}$  wide with prominent valvular apparatus, 2.4-3.2  $\mu\text{m}$  long, 1.6-2.4  $\mu\text{m}$  wide.

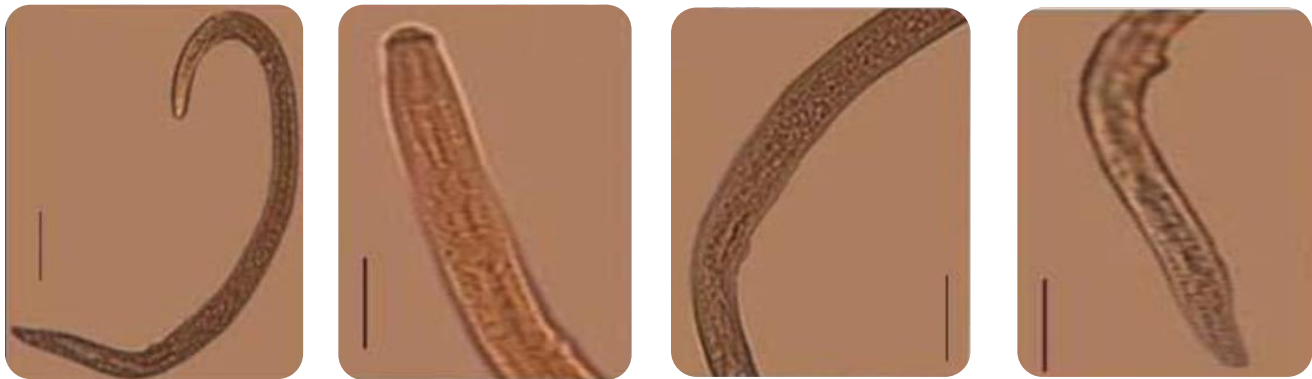


Figure 1: (A-D): Photomicrograph of *Pratylenchus siddiqi* n. sp. A-whole body; B- Oesophageal region; C-Vulval region; D- vulval region with tail. (Scale: A= 10  $\mu\text{m}$ ; B-D=100  $\mu\text{m}$ ).

Esophageal glands lobe overlapping intestine ventrally, nerve ring at middle of isthmus. Excretory pore 75-80  $\mu\text{m}$  from anterior extremity, anterior to basal esophageal lobe. Hemizonid just anterior to excretory pore 2-4 annules wide. Vulva a transverse slit having protruding lips. Reproductive system prodelphic, outstretched anteriorly. Oocytes arranged in single column. Vagina

extending one third of body width. Spermatheca empty, post-vulval uterine sac 14-20  $\mu\text{m}$  long, 1-1.4 times body width at vulva. Phasmid pore-like, usually at anterior of tail 5.6-8  $\mu\text{m}$  from anus. Tail 22-26  $\mu\text{m}$  long, consisting of 18-22 annules, subcylindrical, terminating in a rounded smooth terminus.

**Male:** Not found.

**Type habitat and locality**

Nematode specimens were captured from soil of banana

(Musa acuminata L.) from Malir Cantt. Karachi, Sindh, Pakistan.

Table 1. Morphometric data for *Pratylenchus siddiqii* n. sp. (All measurements are in  $\mu\text{m}$  except L).

Morphological characters	Holotype female	Paratypes Female(n=15)
L (mm)	0.45	0.44 $\pm$ 0.03(0.4-0.48)
a	25	24.7 $\pm$ 2.7 (20-28.8)
b	4	3.9 $\pm$ 0.33 (3.6 -4.8)
c	17	18 $\pm$ 1.9 (14.7-20.9)
c'	2.2	2.2 $\pm$ 0.35 (1.8-2.4)
V%	71.9	75.8 $\pm$ 2.6 (71.9 - 79.4)
Lip region height	2	1.40 $\pm$ 0.3 (1-2)
Lip region width	2	2.0 $\pm$ 0.4 (2-3)
Stylet	16	15.8 $\pm$ 0.52 (15-16)
Median bulb length	12	12-13
Median bulb width	9	9-10
Valvular apparatus length	2.8	2.4-3.2
Valvular apparatus width	2.0	1.6-2.4
Excretory pore from anterior end	75	78 $\pm$ 2.54(75-80)
Pharynx length	78	80 $\pm$ 6.8 (75-85)
Maximum body width	16	17.0 $\pm$ 1.2 (15-20)
Vulval body width	10	11.5 $\pm$ 0.7 (10-13)
Vulva to tail terminus	50	60 $\pm$ 7.2 (50-70)
Post uterine sac	14	15 $\pm$ 1.0 (14-20)
Anal body width	14	12 $\pm$ 0.35 (10-14)
Tail length	26	24.5 $\pm$ 0.63 (22-26)

**Type Specimens**

Holotype and 15 paratypes female were deposited in Nematode collection of NNRC, University of Karachi, Pakistan.

**Etymology**

The species is dedicated to Dr. M.R. Siddiqi for his excellent contributions to Nematology.

**Differential Diagnosis**

*Pratylenchus siddiqii* n. sp., is recognized by a combination of characters viz. body posture irregularly curved after fixation, lateral field with six incisures, 2 annuli in the cephalic region, stylet = 15-16  $\mu\text{m}$  long, V%= 71-78, tail subcylindrical to conoid with smooth terminus and the absence of males. *Pratylenchus siddiqii* n. sp. belongs to the other *Pratylenchus* species viz. *P. estonieunsis* (Ryss, 1982); *P. hexincius* (Taylor and Jenkins, 1957); *P. manaliensis* (Khan and Sharma,

1992); *P. roseus* (Zarina and Shahina, 2013) and *P. teres* (Khan and Singh, 1975) in having six incisures in lateral field and 2-3 head annules but it differs from *P. estonieunsis* in more anteriorly placed vulva (V= 71-78 vs 79-86); lower b value (b= 3.6-4.8 vs 4.6-7.6); lower number of tail annules (19-22 vs 22-30) and in smooth vs annulated tail terminus. It differs from *P. hexincius* in lower b value (3.6-4.8 vs 5.9-8.4); slightly longer stylet (15-16 vs 14-15 $\mu\text{m}$ ); stylet knobs with flattened to concave anterior surfaces vs spherical basal knobs. It differs from *P. manaliensis* in more anteriorly located vulva (V= 71-78 vs 78-83); number of lip annules (2 vs 3); in shorter oesophagus (b= 3.6-4.8 vs 5-7) and in tail terminus (smooth vs annulated). It also differs from *P. roseus* in more anteriorly located vulva (V= 71-78 vs 80.8-82.7); in the absence of lateral membrane at vulva and smooth against annulated tail terminus. It can be

differentiated from *P. teres* in smaller stylet (15-16 vs 16-18  $\mu\text{m}$ ), in number of lip annules (2 vs 3), less

number of tail annules (19-20 vs 24-30) and smooth vs annulated tail tip.

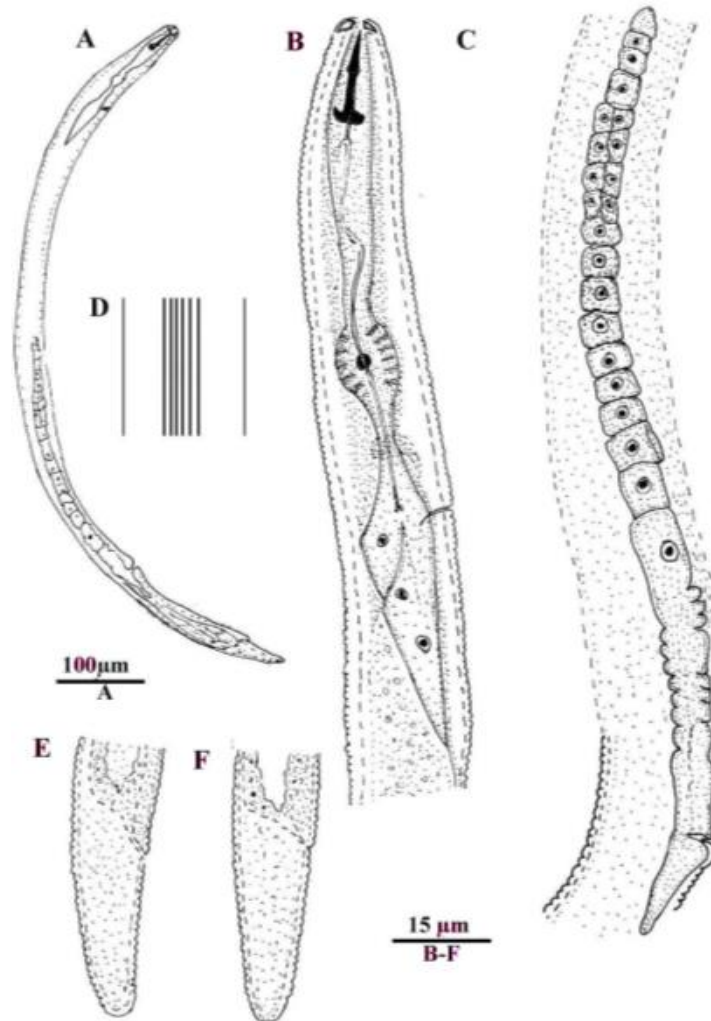


Figure 2: **(A-F)**: *Pratylenchus siddiqii* n. sp. (A-F). A-whole body; B- Oesophageal region; C-Vulval region; D- Lateral field; E-F Tail regions.

### CONCLUSION

The present study focuses on nematodes that occur in association with banana (*Musa acuminata* L.) crop and describes the taxonomy and morphology of the nematodes up-to species level.

### AUTHORS' CONTRIBUTION

Both the authors designed the study, collected nematode samples, identified them, wrote the manuscript and reviewed the manuscript.

### CONFLICT OF INTEREST

The authors declare no conflict of interest.

### REFERENCES

Baermann, G., 1917. A simple method for the detection

of *Ankylostomum* (nematode) larvae in soil tests, Mededelingen uit het Geneeskundig Laboratorium te Weltevreden pp. 41-47.

Cobb, N.A., 1918. Estimating the nema population of soil, with special reference to the sugar-beet and root-gall nemas, *Heterodera schachtii* Schmidt and *Heterodera radicola* (Greef) Müller: and with a description of *Tylencholaimus aequalis* n. sp., in: Agriculture, U.S.D.o. (Ed.). US Government Printing Office, Washington, D.C., p. 48.

De Man, J.G., 1880. Die einheimischen, frei in der reinen Erde und im süßen Wasser lebende Nematoden, Preliminary report and descriptive systematic

- part. Brill, p. 143.
- Filipjev, I.N., 1936. On the classification of the Tylenchinae. Proceedings of the Helminthological Society of Washington 3, 80-82.
- Hooper, D.J., Hallmann, J., Subbotin, S.A., 2005. Methods for extraction, processing and detection of plant and soil nematodes. Plant Parasitic Nematodes in Subtropical and Tropical Agriculture 2, 53-86.
- Iqbal, E., Mehmood, N., Kazi, N., Fayyaz, S., 2020. Description of *Paratylenchus manilkarii* n. sp., *P. sindhicus* n. sp., and Observation of *Pratylenchus kralli* Ryss, 1982 from Chikoo (*Manilkara zapota* L. van Royen) Orchards of Balochistan and Sindh, Pakistan. Pakistan Journal of Zoology 52, 693-698.
- Khan, E., Singh, D.B., 1975. Five new species of *Pratylenchus* (Nematoda: Pratylenchidae) from India. Indian Journal of Nematology 4, 199-211.
- Khan, M.L., Sharma, N.K., 1992. A description of *Pratylenchus manaliensis* sp. n. associated with apple in India (Nematoda: Pratylenchinae). Nematologia Mediterranea 19, 275-277.
- Ryss, A., 1982. New phytonematode species of the genus *Pratylenchus* in Estoni. Biologia 31, 22-29.
- Shahina, F., Nasira, K., Firoza, K., Erum, Y.I., 2019. Overview of the nematode fauna of Pakistan. Pakistan Journal of Nematology 37, 171-243.
- Siddiqi, M.R., 2000. Order Tylenchida, Tylenchida: Parasites of Plants and Insects, pp. 86-121.
- Taylor, D.P., Jenkins, W.R., 1957. Variation within the nematode genus *Pratylenchus*, with the descriptions of *P. hexmasus* n. sp. and *P. svbpewtrans* n. sp. Nematologica 2, 159-174.
- Zarina, B., Shahina, F., 2013. Annotated bibliography on plant nematology in Pakistan. National Nematological Research Centre, University of Karachi, Karachi-75270.