International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

A New Species of the Genus Tigronchoides Ivanova and Dzhuraeva, 1971, (Nematoda, Anatonchidae), From India

Mahasweta Guha[1], Viswa Venkat Gantait[2]

[1*]G-5/21, A. P. Nagar Sonarpur, Kolkata-700150, West Bengal, India
Corresponding Author Email: *guhamahasweta2[at]gmail.com*
Mob. No.9007717480;
https://orcid.org/0000-0003-4728-8374

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

Abstract: ***Tigronchoides jairajpurii sp. n., a new mononchid nematode under the family Anatonchidae is described and illustrated. This is found in the rhizospheric soil of paddy in the Sunderban region of South 24 Parganas district of West Bengal, India. This is characterized by a medium-sized body (1.5-1.8 mm ♀), two retrorse arrows-like hanging dorsal teeth projecting downward in a roomy barrel-shaped buccal cavity with small sub ventral denticles, and the presence of foramina, longitudinal vulva, and long filiform tail with spinneret which show marked differences from other species of the genus. The species key of this genus is also provided hereunder. This finding shows a scope of mangrove fortification and paddy field safeties. Thus, it will be helpful for environment protection and economic development also.***

Keywords: India, paddy, Sunderban, South 24 Parganas, Tigronchoides jairajpurii sp. n., West Bengal

1. Introduction

During a faunistic survey in Sunderban delta (21°57′N 89°11′E) of South 24 Parganas district of West Bengal, India, in 2022, a new mononchid nematode belonging to the genus *Tigronchoides* was collected from rhizospheric soil of paddy (Oryza sativa L.). *Tigronchoides* was erected by Ivanova and Dzhuraeva in 1971 under the family Tigronchidae. Andrássy (1976) placed it under Anatonchidae[2]. Sidiqqi (1984) synonymized Tigronchoides with Anatonchus belonging to the family Anatonchidae[9]. But again, it was revalidated by Andrássy in 1993[3]. Ahmad and Jairajpuri (2010) had given the perfect status of this genus[1]. Presently it has a global strength of 10 species. A new species of this genus is being described and illustrated. *Tigronchoides jairajpurii* sp. n. differs from other species of this genus by having two retrorse arrow-like hanging dorsal teeth projecting downward from the anterior wall of a roomy barrel-shaped buccal cavity, two small sub-ventral denticles and a long filiform tail with spinneret. The species key of the genus is also provided herein. This finding shows a scope of mangrove fortification as well as helpful for carbon sink protection and paddy field safeties. Thus, it will be helpful for environment protection and economic development also.

2. Materials and Methods

The nematodes were extracted from rhizosphere soil samples (250 gm) of paddy (Oryza sativa L.) following Cobb's sieving technique (Cobb1918)[5] and decanting method followed by 'Modified Bearman's Funnel Method (Christie & Perry, 1951)[4]. The specimens were fixed by FAA solution following 'Seinhorst's slow dehydration method' (Seinhorst, 1959)[8]. Permanent slides of nematodes were prepared in anhydrous glycerine and sealed by paraffin. Measurements were taken and diagrams were drawn with the help of an ocular micrometre using an Olympus research microscope with a drawing tube attachment; model no. BX41. Dimensions were tabulated following De Man's formula (De Man 1884)[6].

3. Result

Family AnatonchidaeJairajpuri, 1969
Subfamily AnatonchinaeJairajpuri, 1969
Genus *Tigronchoides*Ivanova & Dzhuraeva, 1971

Diagnosis. Medium-sized body, slick cuticle without annulations, spacious as well as capacious globe-shaped buccal cavity persist. Interparietaleis obliquely grooved, situated dorsally. Retrorse teeth, hanging from the anterior with pointed projections, are the most diagnostic features of this genus. Pharyngo-intestinal junction is tuberculate. The tail structure is the same in both sexes including the presence of caudal glands and spinneret, which are conspicuous characteristics of genus *Tigronchoides*.

Composition. Nine endemic species are known from Brazil, Italy, Romania, Australia, Bulgaria, Poland, Tadzhikistan, and India, while one species is distributed in many places, viz. Romania, Italy, Bulgaria, Poland, Spain, the USA, New Zealand, and Tadzhikistan.

Tigronchoides jairajpurii sp. n.
(Figs. 1, 2; Table. 1)

Diagnosis: The species is characterized by the medium-sized body (1.5-1.8 mm ♀), two retrorse arrows-like hanging dorsal teeth projecting downward in a roomy barrel-shaped buccal cavity with two small sub-ventral denticles, and the presence of foramina in the base of the

buccal funnel bearingamphidelphic reproductive system with slit-like longitudinal vulva, and a long filiform tail with spinneret.

Description Structure: It has large and pithy body, having a strongly sclerotized and well-developed feeding apparatus, and a long and highly muscular cylindroid pharynx. Body is medium-sized, ventrally curved after fixation. Cuticle smooth, 2.0-2.5 µm thick at the mid-body, mainly extra slick in the tail region. The hypodermis is viscid in the dorsal, ventral, and lateral positions to form four hypodermal chords which protrude into the pseudo-coelomic cavity in between the somatic muscles, dividing them into four precincts.

The lip region is slightly offset and a bitvast than the adjoining body, 54-58 µm broad and 17-18 µm high. Buccal cavity barrel-shaped, cylindrical, angular in mid-region, nearly as broad as long, 49-50 x 36-38 µm. Large spacious strongly developed, sclerotized buccal cavity with two retrorse arrow-like dorsal teeth, which are unequal in shape, projecting downward, hanging from the anterior wall. The extreme dorsal tooth is 17-18 µm in height and the middle one is slightly longer than the previous one, 24-25 µm. Teeth are located from the anterior end of the buccal cavity, becoming thinner and somewhat angular in the mid-region. The distance of teeth apices from the basal margin of the buccal cavity is only 10%. Two small sub-ventral denticles are also prominent on the right side of the amphid. The total length of the base of the buccal funnel is 30µm and the crown-like head of the buccal funnel's base is 12-13 µm high. Prominent foramina persevere at the right side in the bottom of the crown-shaped buccal funnel's support. Amphid is established anteriorly, just near the tiny sub-ventral denticles.

The amphidial chambers are connected to amphidial canals which terminate in wide sensilla pouches that are richly supplied with nerve fibres. The Oesophagus length is strongly muscular, long, and cylindroid; the anterior portion is usually slightly expanded to enclose the base of the buccal cavity. It appears slightly narrower at the point where it is enveloped by the nerve ring; thereafter it expands gradually, but only slightly, towards its base. The pharyngeal lumen is very well developed. The pharynx-intestinal junction is tuberculate in shape. Oesophageal glands are prominent and the end of the pharynx show pointed projections. The nerve ring is a conspicuous, broad, collar-like structure. The excretory pore, which is situated on the ventral surface of the body a little posterior to the nerve ring, is marked by a prominent depression in the cuticle. The pharynx-intestinal junction is made up of transparent tissues. This portion has a funnel-shaped valve including sphincter muscles. Disc-shaped cardia endure. The peripheral ends of the three arms of the sclerotized pharynx-intestinal junction lining become inflated and greatly thickened, forming conspicuous hollow tubercles. From this point, a narrow duct extends posteriorly and forms the anterior part of the tripartite funnel shape. In the intestine, the granules present inside the cells frequently give it a tessellate appearance.

Female gonads are amphidelphic; each set possesses an ovary, oviduct, and uterus leading to a common vagina. Vagina is 10µm wide and non-sclerotised longitudinal vulva (10 x 20µm). At this site, body width becomes maximum, 90-91 µm. This is 10 % wider than the anal body width. The terminal and growth zones are demarcated. Vulval papillae absent. The oviduct is made up of high, columnar, epithelial cells and consists of a narrow distal and an enlarged proximal part. The anterior oviduct is 11% longer than the posterior one. The anterior ovary is 25% bigger than the posterior ovary. The uterus is hollow and sac-like, its walls being made up of circular and oblique muscles. The uterus may function as an organ for the storage of sperm.

The distance from the head to the vulva is near about three times longer than the length of the vulva to the anus. The posterior part of the intestine is connected to a dorso-ventrally compressed tube, the rectum that opens externally through the anus. It is lined internally by the cuticle and externally covered by a layer of large epithelial cells. Tail elongated, filiform with spinneret, approx. four anal body lengths long. Caudal glands poorly persist, leading through a terminal duct. The gland opening is guarded by a well-developed cuticularized structure, the "spinneret".

Male. Not found.
Type material. Holotype, female, Sunderban. Paratype, 2 females, Sunderban.

Type habitat and locality. The species collected from the rhizospheric soil of paddy (Oryza sativa L. cv. Shyamali) in the Basanti block of Sunderban delta in South 24 Parganas district of West Bengal, India in May 2022.

Deposition of type Specimen. Specimens will be deposited at the National Zoological Collections (NZC) of the Zoological Survey of India, Kolkata, India.

Etymology. The species is named after the great Nematologist, Prof. Dr. Shamim Jairajpuri.

4. Discussion

Tigronchoides jairajpurii sp. n., is characterized by two retrorse arrows-like hanging dorsal teeth projecting downward from the anterior wall of a roomy barrel-shaped buccal cavity. It bears two small sub-ventral denticles including the crown-shaped apex of stoma. Its long filiform tail with spinneret and longitudinal vulva without papillae, shows similarities with four different species of this genus, i.e., T. ginglymodontus (Mulvey, 1961) Andrássy, 1993[3], T. andrassyi Winiszewska et. al. 2013[11], T. quercusV. Peneva et. al. 1999[10], and T. istvani (Winiszewska-Slipinska, 1989) Andrássy, 1993[3].

Tigronchoides jairajpurii sp. n. closely resemblances with T. ginglymodontus (Mulvey, 1961) Andrássy, 1993 having a medium-sized body, hanging teeth from the anterior end of the buccal capsule, curved tail, amphidelphic gonad, but it differs with crown shaped apex of stroma, foramina, and sub-ventral denticles. Two large

size teeth are hanging from the anterior end of the buccal cavity but three medium-sized teeth hang in T. ginglymodontus. Pre-and post-vulval papillae are present in T. ginglymodontus but absent in present species. T. andrassyi Winiszewska et. al. 2013 shows resemblances with the present species by the medium-sized body and longitudinal vulva but differs with teeth at the anterior fourth (vs. anterior end) and evenly tapered tail with cone-shaped posterior part (vs. long tail with no tapering containing spinneret). However, the distance of teeth apices from the anterior margin of the buccal cavity for T. jairajpurii sp. n. is 10% but 29.2-33.6% of the buccal cavity length of T. andrassyi. T. jairajpurii sp. n. is distinct from T. quercus and T. istvani by longitudinal vulva and the presence of teeth at the anterior end. T. quercus and T. istvani are having transverse vulvae and teeth located at the anterior fourth of the buccal cavity. These including the other three species under the family Anatonchidae are peculiar predator specimens, which are first found in paddy field rhizospheric soil of the Sunderban region of the West Bengal district of India.

Key to Species of *TIGRONCHOIDES*

1-Female monodelphic with post-uterine sac 2
Female amphidelphic 3
2-Buccal cavity much wider than height; body length 3mm, tail straight; male unknown . . . . . T. monohystera
Buccal cavity width smaller than height; body length 2 mm, tail arcuate; male with ventromedian supplements 13-17. . . . . T. amiciae
3-Body 4-5mm long, tail filiform, 12-20 anal body diam. long; in males, spicules 80-90 µm long with ventromedian supplements 13-14. . . . . T. filicaudatus
Body 2-3 mm long, tail shorter; male with ventromedian supplements 9-18. 4
4-Tail hook like and sling. 5
A tail curve-like and not sling. 6
5-Male spicules 120-130 µm long and ventromedian supplements 9-12. . . . . T. australicus
Male spicules 140-150 µm long with ventromedian supplements 14-15. . . . . T. sukuli
6-Teeth located at anterior fourth of buccal cavity. 7
Teeth located at the anterior end of buccal cavity. 8
7-Foramina present in stoma. . . . . T. andrassyi
Foramina absent in stoma. 9
9-Buccal cavity short (48-58 µm), male with ventromedian supplements 12-15. . . . . T. quercus
Buccal cavity long (61-67 µm), male with ventromedian supplements 16-18. . . . . T. istvani
8-Sub-ventral denticles in the buccal cavity and spinneret in the tail absent. . . . . T. ginglymodontus
Sub-ventral denticles in buccal cavity and spinneret in tail present. . . . . ***Tigronchoides jairajpurii*** sp. n.

5. Conclusion

Tigronchoides jairajpurii sp. n. is a new discovery of zoology. It is found from rhizosperic zone of paddy. It is totally different from others species of this genus and €species keys are also provided hereunder.

6. Future Scope

At very recent, mangroves of coastal region become in threatened condition. These mangroves are storage of carbons also. So, they are act as carbon sink. Presence of plant parasitic nematodes affects those mangroves very much. This new finding can help us to find a new path to protect our mangroves. Besides these, as paddy is our economical crop and it also affected by plant parasitic nematodes, this species can help uprise our nations' economy. Simultaneously, it need much more research works to know them properly. Hence, this finding shows a huge future scope.

Acknowledgments

The corresponding author is grateful to Dr. Dhriti Banerjee, Director of the Zoological Survey of India, for permitting the research work. This study is performed in a faunistic survey in the Sunderban delta (21°57′N 89°11′E) of South 24 Parganas district of West Bengal, India in 2022

References

[1] Ahmad, W. & Jairajpuri, S. (2010): *Mononchida-The Predatory Soil Nematodes*. Nematology monographs and perspectives. *Vol.7*-Brill, Leiden-Boston, 157-168 pp. ISBN 978-90-04-17464-1
[2] Andrassy, I. (1976): *Evolution as a basis for the systematization of nematodes*. -Pitman Publishing, London, UK, 288 pp.
[3] Andrassy, I (1993): A taxonomic survey of the family Mononchidae (Nematoda). -*Acta Zoologica Hungarica*, **39**, 13-60.
[4] Christy, J. R., & Perry, V. G. (1951): Removing nematodes from soil. -*Proc. Helminthol. Soc. Wash.*, **18**: 106-108.
[5] Cobb (1918): *Estimating the nematode population of the soil*. -Agric. Tech. Circ. U. S. Dept. Agriculture, 48 pp.
[6] Deman, J. G. (1884): *Die frei in derreinen Erde und imsüssen Wasserlebenden*-Nematoden der niederlandischen Fauna, Leiden 206 pp.
[7] Liskova. M. (2008): New records of mononchid nematodes from forests in the Slovak Republic-*Helminthologia*, **45 (3),** 134-136.

[8] Seinhorst, W. (1959): A rapid method for the transfer of nematodes from fixative to anhydrous glycerin. -*Nematologica*, **4**, 67- 69. http://dx.doi.org/10.1163/187529259X00381
[9] Siddiqi M. R. (1984): Four new genera and four new species of mononchs (Nematoda). -*Pakistan Journal of Nematology*, **2**, 1- 13.
[10] Peneva. V., Neilson. R., Nedelchev. S. (1999): *Mononchid Nematodes from Oak Forest in Bulgaria. 1. The Subfamily Anatonchinae Jairajpuri, 1969 with descriptions of Anatonchusgenovi sp. N. and Tigronchoidesquercus sp. n*. *Vol-1*-Brill, Leiden-Boston 37-53 pp. Doi: 10.1163/156854199507965
[11] Winiszweska, G. & Susulovsky, A. & Kornobis, F. (2013): *Tigronchoidesandrassy* sp. Nov (Nematoda: Anatonchidae), New Mononch with longitudinal vulva from Baltic Coastal Dune in Poland. *Annales Zoologici*, **63 (1)**, 1-5. DOI: 10.3161/000345413X666057

Authors Profile

Mahasweta Guha. Ph.D Scholar of Zoological Survey of India, Kolkata, Asstt. Teacher (Bioscience) of Pratapnagar Giridhari High School.

Dr. Viswa Venkat Gantait. Assistant Zoologist of Zoological Survey of India, Kolkata.

Table 1: Measurements and morphometrics of *Tigronchoides jairajpurii sp*. n. All measurements are in µm except L inmm.

Character	HOLOTYPE ♀	PARATYPE ♀♀	MEAN±SD
L	1.76	1.64-1.76	1.7±0.06
a	19.4	18.65-20.15	19.4±0.75
b	4.8	4.59-5	4.8±0.2
c	4.84	4.34-5.04	4.84±0.5
c'	6.98	6.38-7.62	6.96±0.6
V	57.8	56-58.6	57.8±1.8
V'	72.8	70.8-74.8	72.8±2.0
G1	6.96	6.06-7.86	6.96±9
G2	5.57	5.00-6.14	5.57±.57
Lip height	17.15	16-18.3	17.15±1.15
Lip width	54	52-56	54±2
Maximum body width	90.65	87.5-93.8	90.65±3.15
Lip with buccal cavity-total height	66.15	65-67.3	66.15±1.15
Length of buccal cavity	50	49.35-50.65	50±0.65
Diameter of buccal cavity	36.75	36.7-36.8	36.75±0.05
Position of dorsal tooth from the base of buccal cavity	10%	10%	~10%
Length of hanged first dorsal tooth	17.15	17-17.3	17.15±0.15
Length of hanged second dorsal tooth	25	25.5-26	25±0.5
Percentage of long dorsal tooth of total buccal cavity length	90%	90%	~90%
Length of crown like part of the base of buccal funnel or stoma	12.25	12-12.50	12.25±0.25
Width of stoma	30	29.5-30.5	30±0.5
Upper pharynx	122.5	122-123	122±0.5
Lower pharynx	245	244.5-245.5	245±0.5
Total pharynx	367.5	367-368	367±0.5
Nerve ring distance from anterior end	311.15	311-311.30	311±0.15
Body wide at pharyngo-intestinal junction	85.75	85-86.5	85.75±0.75
Cardia size	12.25 X 7.35	(12-12.5) X (7.3-7.4)	(12.25±0.25) X (7.35±0.05)
Distance of excretory pore from lip	312	311.5-312.5	312±0.05
Body width at vulva	91	90.5-91.5	91±0.5
Vulval height	19.6	19-21.2	19.6±0.6
Vaginal width	9.8	9.3-10.3	9.8±0.5
Vulval width	14	13.2-14.2	14±0.2
Anterior ovary	122.5	122-123	122.5±0.5
Anterior oviduct	61.25	61-61.5	61.25±0.25
Posterior ovary	98	97.5-98.5	98±0.5
Posterior oviduct	49	48.4-49.6	49±0.6
Distance from head to vulva	1016.75	1016-1017.5	1016.75±0.75
Distance from vulva to anus	379.75	379-380.5	379.75±0.75
Length of prerectum	183.75	183.7-183.8	183.75±0.05
Length of rectum	36.75	35.75-37.75	36.75±1.00
Length of tail	362.6	362.2-363	362.6±0.4
Anal body width	82.25	82-82.50	82.25±0.25
Distance from Head to anus	1396.75	1396-1397.5	1396.75±0.75

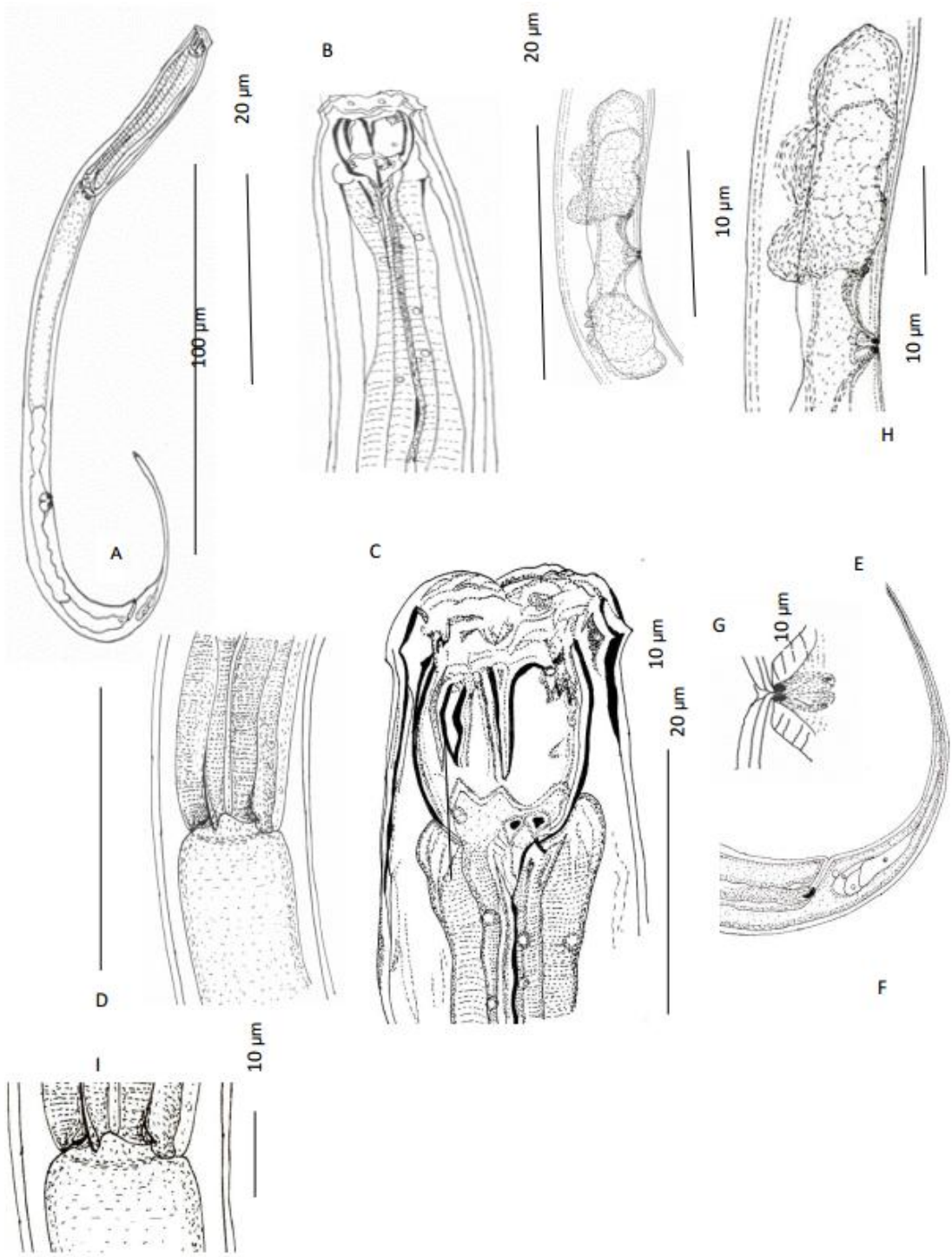

Figure 1: Camera Lucida drawing of *Tigronchoides jairajpuri*in. sp., Female A. Whole body, B. Structure of buccal cavity with stoma and anterior body part showing pharyngeal structure, C. Teeth pattern, D. Pharyngo-intestinal junction, E. Both gonads with vulva, F. Posterior region of body with anus, G. Structure of vulva, H. Vulva with anterior gonad, I. Oesophago-intestinal junction with showing cardia.

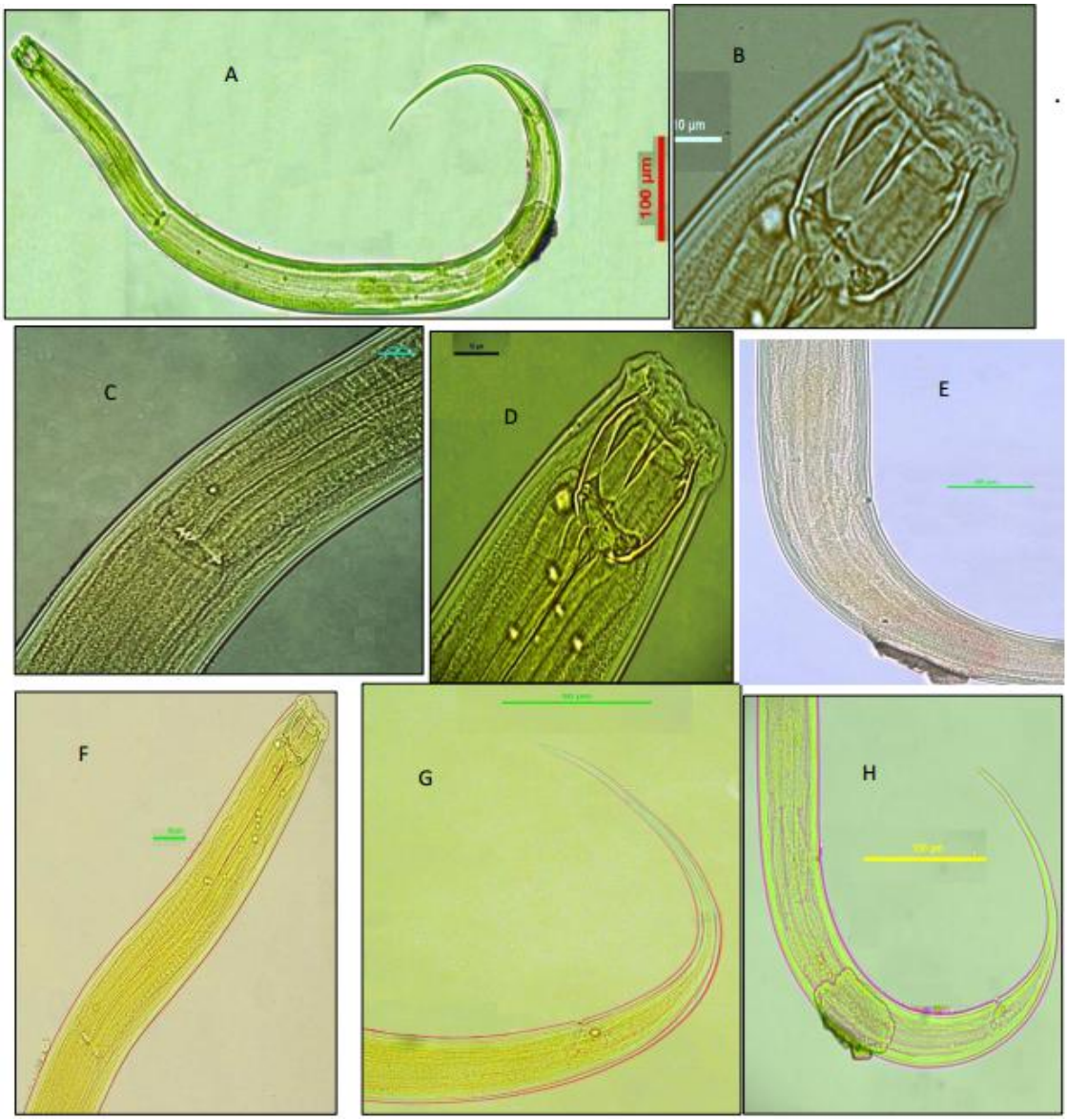

Figure 2: Photomicrographs *of Tigronchoides jairajpuri*n. sp., Female A. Whole body arrow point the gonads, B. Structure of buccal cavity with stoma, arrow shows the foramina C. Pharyngo-intestinal junction, arrow shows the tuberculate ending of pharynx, D. Teeth pattern, E. Gonads with vulva, arrow shows the vulva, F. Posterior region of body with anus, arrow shows the anus, G. Anterior body part showing pharyngeal structure, H. Tail tip with spinneret, arrow shows the spinerret. (Photomicrographs are taken by Nikon eclipse Ni-u Microscope)