

# *Thripinema khrustalevi* sp. n. (Tylenchida: Allantonematidae), a parasite of *Thrips* (Thysanoptera) in Moscow

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Accepted for publication 23 March 1995

**Summary.** Specimens of *Thripinema khrustalevi* sp. n. were recovered from thrips (*Thrips trehernei* Prisner. and *T. physopus* L.) associated with the flowers of *Taraxacum officinale* Wigg. and *Hieracium* spp. (Compositae) in Moscow lawns. *Thripinema khrustalevi* sp. n. can be distinguished from the related species *T. aptini* (Sharga, 1932) Siddiqi, 1986 and *T. reniraoi* (Reddy, Nickle & Rao, 1982) Siddiqi, 1986 by differences in the structure of the bursa, the shape of the male tail, and, the presence of basal knobs on the stylet in infective females. The new species can be distinguished from *T. nicklewoodi* Siddiqi, 1986 by the position of the orifice of the dorsal esophageal gland in infective females and the absence of a tail cone in the parasitic female. Transmission electron microscopy analysis showed that parasitic females did not have cuticle and their integument consisted of microvilli. The microvilli were coated by the thin covering layer. An identification key for the genus *Thripinema* is given.

**Key words:** *Thripinema khrustalevi* sp. n., thrips, integument, ultrastructure, Russia, identification key.

The genus *Thripinema* currently contains three species: *T. reniraoi* (Reddy, Nickle & Rao, 1982) Siddiqi, 1986, *T. aptini* (Sharga, 1932) Siddiqi, 1986 and *T. nicklewoodi* (Nickle & Wood, 1964) Siddiqi, 1986. The first two species were reported from India, and the third from North America. In this paper we describe a new species of *Thripinema* found in Russia.

## MATERIALS AND METHODS

Nematodes were collected in 1993 from thrips present on flowers of the Compositae growing in Moscow lawns. Parasitic stages of the nematode were recovered from adult thrips, and, free-living stages from flowers. A total of 837 nymphs and 3280 adult thrips were dissected to evaluate the infestation dynamics and life-cycle of the parasite. The prevalence of thrips infesting the nematodes at different sites in Moscow ranged between 10% and 50% during September 1993. The nematodes were fixed in 4% TAF, processed and mounted in glycerin. The description and drawings were made from live and from mounted specimens. In the description the body

length (L) and De Manian indices, D - maximal diameter of the body, St - stylet length, Cd - tail length and V (vulva position as a percentage of the body length) are presented. The mean value and the range (in parenthesis) are given.

Parasitic females were also processed for examination of the integument by transmission electron microscopy. Nematodes were fixed in 2.5% glutaraldehyde in 0.05 M phosphate buffer (pH=7.2) at 22° C, postfixed in 1% osmium tetroxide, dehydrated in an ethanol series and embedded in Epon resin. Ultrathin sections were stained with uranyl acetate and lead citrate and then examined in a Jeol JEM-100 B at 80 kV.

## DESCRIPTION

*Thripinema khrustalevi* sp. n.  
(Figs. 1 & 2)

Holotype parasitic female: L = 240  $\mu$ m, a = 2.0, D = 120  $\mu$ m, St = 14  $\mu$ m, V = 100%.

Paratype parasitic females (n = 15): L = 250 (180-

320)  $\mu\text{m}$ ,  $a = 2.0$  (1.6-2.5),  $D = 120$  (97-170)  $\mu\text{m}$ ,  $St = 14-15$   $\mu\text{m}$ ,  $V = 95-100\%$ .

**Paratype infective females** ( $n = 15$ ):  $L = 320$  (300-340)  $\mu\text{m}$ ,  $a = 24.1$  (22.1-28.0),  $b = 6.6$  (6.0-7.2),  $c = 11.2$  (10.0-13.3),  $V = 82-85\%$ ,  $D = 13$  (11-14)  $\mu\text{m}$ ,  $Cd = 29$  (25-33)  $\mu\text{m}$ ,  $St = 13-15$   $\mu\text{m}$ .

**Paratype free-living males** ( $n = 15$ ):  $L = 280$  (230-340)  $\mu\text{m}$ ,  $a = 19.5$  (12.8-25.5),  $c = 11.6$  (9.3-13.6),  $D = 16$  (11-20)  $\mu\text{m}$ ,  $Cd = 25$  (20-29)  $\mu\text{m}$ , spicules = 12-14  $\mu\text{m}$ , gubernaculum = 5-6  $\mu\text{m}$ .

**Eggs:** 57 (48-63)  $\times$  26 (22-29)  $\mu\text{m}$ .

**Parasitic female.** Body usually oval or occasionally spherical, usually with head cone 11-20  $\mu\text{m}$  long. Stylet and deformed oesophageal lumen clearly visible. Vulva terminal or subterminal. Some specimens have a small vulval cone consisting of two slightly protruding lips. Uterus large, muscular, containing one egg. Genital tube curved spirally and occupying the whole body. The body shape of parasitic females differs in individuals of different age: in older specimens the anterior end, with stylet and oesophageal lumen still visible, can be completely inverted inside the body. The protruding vulva lips in younger specimens are not present in older females which have a characteristic egg-shaped or spherical body.

**Infective female.** Body straight or slightly ventrally curved. Lateral field with two incisures. Lip region set off from the body, slightly prominent, 4-5  $\mu\text{m}$  dia. Amphids slit-like. Stylet well developed with slight thickening in the mid-section. Oesophageal lumen straight, 30-35  $\mu\text{m}$  long, walls sclerotised. Orifice of dorsal esophageal gland 2-5  $\mu\text{m}$  posterior to stylet base. Base of subventral glands 180-200  $\mu\text{m}$ ; base of dorsal gland 220-240  $\mu\text{m}$  from head end. Nerve ring 70-80  $\mu\text{m}$  from head end. Excretory pore not visible. Ovary primordium 70-100  $\mu\text{m}$  long; 200-220  $\mu\text{m}$  from head end. Vulva situated near anus; vulva-anus distance 21-28  $\mu\text{m}$ ; body diameter at vulva 10-12  $\mu\text{m}$ ; at anus 8-9  $\mu\text{m}$ . Tail conoid with blunt terminus.

**Free-living male.** Body usually straight, occasionally tail end dorsally curved. Lateral field contains two incisures, 5-6  $\mu\text{m}$  wide. Head diameter 5  $\mu\text{m}$ . Structures of head capsule, stylet and esophagus

not discernible. Genital tube 155-228  $\mu\text{m}$  long, commencing at 60-120  $\mu\text{m}$  from head end. Spicules narrow, arch-shaped, the edges of the spicule base swollen. Gubernaculum long. Bursa well developed, up to 5  $\mu\text{m}$  wide, commencing anterior to the spicule base and reaching the tail terminus. Tail conoid with a blunt terminus.

**Biology.** A maximum of 10 infective females, recently molted, were recovered from individual thrip nymphs. Infective females were not found in adult, or recently molted thrips. A maximum of six parasitic females at the stage of oviposition were recovered from individual adult thrips and, apparently, the development of all other parasitic nematodes was inhibited or stopped. The female develops inside the insect body cavity into a mature parasitic female and then commences egg-laying. The nematodes develop in the host's haemocoel and exit as fully developed females and males. Free-living males and females mate in the environment.

In Moscow, during the growing season in 1993, the infection prevalence reached 50% in some areas.

**Ultrastructure of the integument.** Transmission electron microscopy analysis showed that parasitic females did not have cuticle and their integument consisted of a covering layer and microvilli (Fig. 3). The hypodermal cytoplasm contained numerous mitochondria, vacuoles, electron-dense droplets and nuclei with nucleoli. The microvilli length varied from 1.3 to 2.8  $\mu\text{m}$  (Fig. 3C). The microvilli were coated by the thin covering layer. Occasionally, the friable extracellular material was deposited between the covering layer and the microvilli. Some parasitic females did not have the covering layer, therefore, it is possible that it only develops in mature parasitic females (Fig. 3B).

**Type host and locality.** Nematodes were recovered from: *Thrips trehernei* Prisner (type host) and *Thrips physopus* L. (Thysanoptera) associated with the flowers of *Taraxacum officinale* Wigg. and *Hieracium* spp. (Compositae) in Moscow lawns. Nematode infection of thrips was present only in specimens from Moscow despite numerous dissections of thrips from neighbouring regions in Russia. Infested thrips were found mainly on vegetation close to major

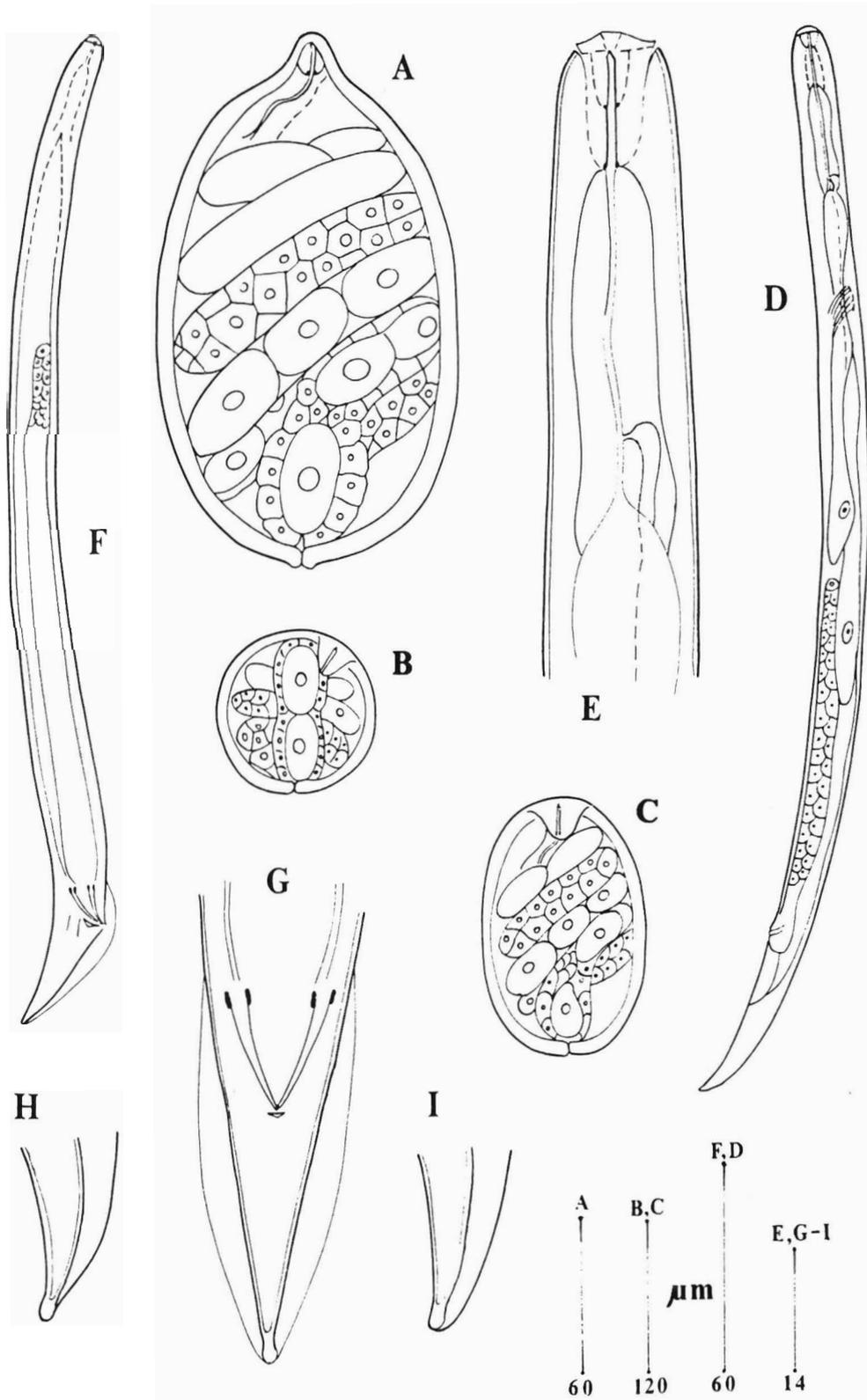


Fig. 1. *Thripinema khrustalevi*. A: Mature parasitic female; B-C: Mature parasitic females; D: Infective female; E: Anterior end of infective female; F: Free-living male; G-I: Male tail.

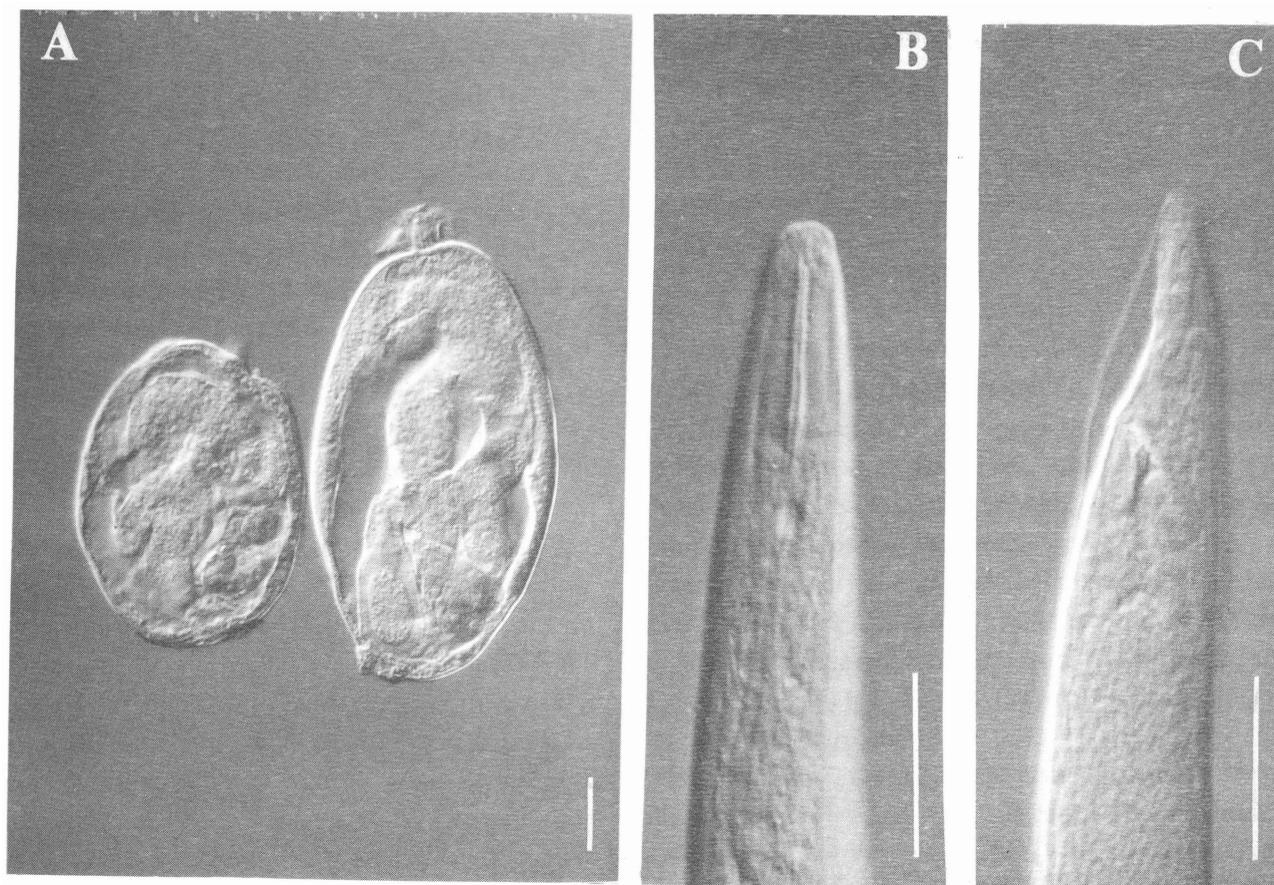


Fig. 2. *Thripinema khrustalevi*. A: Parasitic females; B: Anterior end of infective female; C: Posterior end of male. Scale bars: A - 50 µm, B, C - 15 µm.

roads and thrips collected from the city parks were not infected.

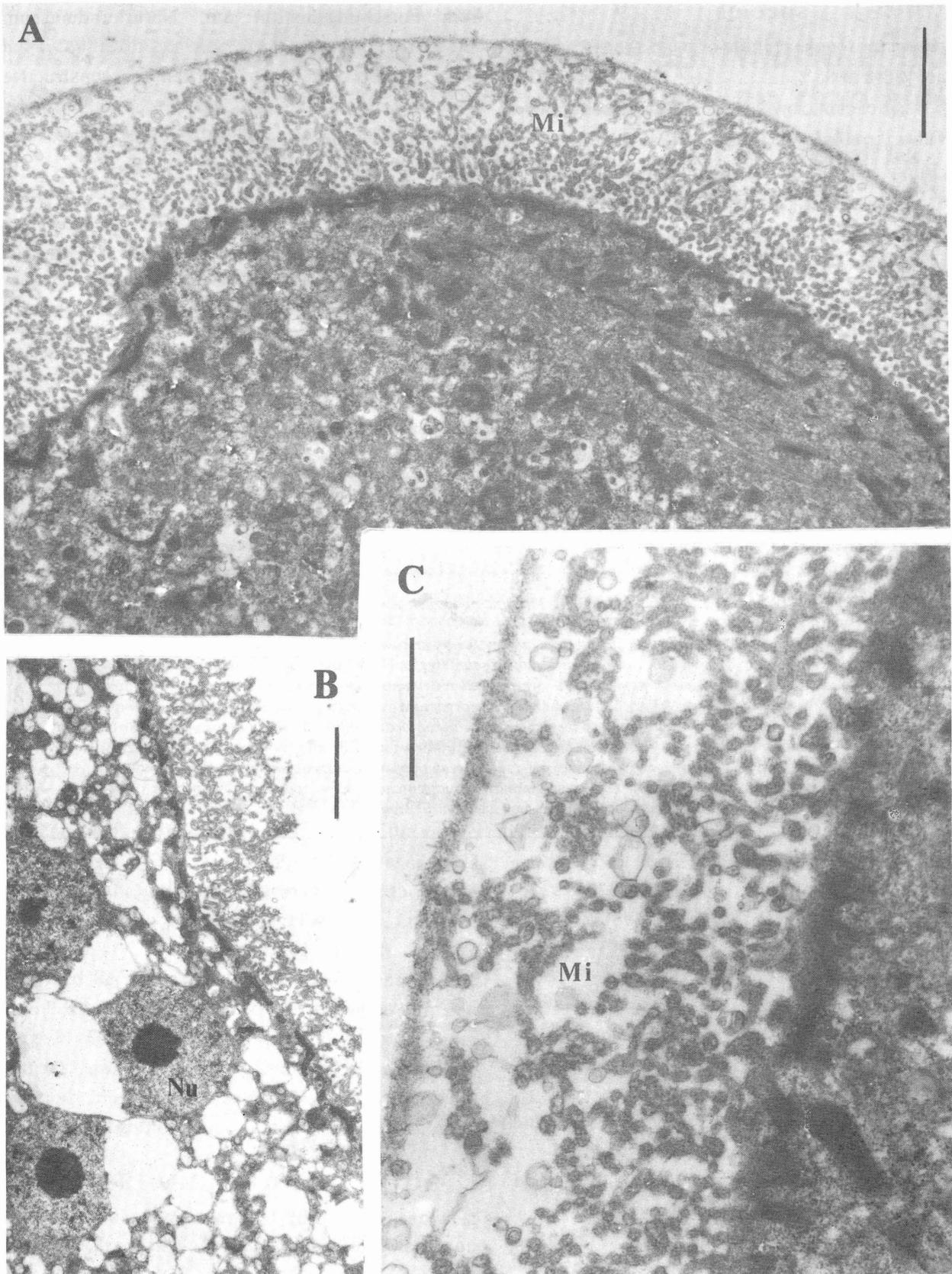
**Type material.** Holotype parasitic female (70/77), paratype parasitic females (70/78-79) and paratype free-living males and females (70/80-82) are deposited in the Nematode collection of the Institute of Parasitology (Moscow). Paratype females and males are also deposited in the German Nematode Collection in Münster (178/1/1-4).

**Differential diagnosis.** *Thripinema khrustalevi* sp. n. is distinguished from *T. aptini* and *T. reniraoi*, the most similar species, by differences in the structure of the bursa: the bursa of the new species is peloderan or terminal, whereas in *T. aptini* and *T. reniraoi* it is adanal. The male tail of the new species is conoid with a slightly blunt terminus, but in *T. aptini* the tail

terminus is pin-like. The stylet of the infective female of *T. khrustalevi* sp. n. has basal knobs, whereas the stylet of *T. aptini* and *T. reniraoi* is without knobs (Sharga, 1932; Reddy et al., 1982).

The new species can be distinguished from *T. nicklewoodi* by the position of the orifice of the dorsal esophageal gland: in *T. khrustalevi* sp. n. it is situated just anterior to the esophageal lumen (2-5 µm), near the orifices of the subventral glands, whereas in *T. nicklewoodi* it is in the center of the esophageal lumen, in the median bulb region. The parasitic females of the new species do not have a tail cone and V=95-100%, whereas the female of *T. nicklewoodi* has a tail cone and V is 85% (Nickle & Wood, 1964; Siddiqi, 1986).

**Etymology.** The species is named after A. V. Khrustalev who first found it in *Thrips* spp. on flowers of Compositae in Moscow.



**Fig. 3.** *Thripinema khrustalevi*. The body wall of the parasitic female. A: Total view; B: The hypodermal cytoplasm with nuclei (Nu). The microvilli (Mi) are not coated by the covering layer; C: Numerous microvilli on the surface of parasitic female. Scale bars: A, B - 2  $\mu$ m, C - 1  $\mu$ m.

## Identification key of *Thripinema* species

1. Parasitic female spindle or bean shaped with tail cone. Vulva at 85% ..... *T. nicklewoodi*  
- Parasitic female oval or spheroid, without tail cone. Vulva terminal, 100% ..... 2
2. Bursa peloderan or terminal, male tail end - conoid ..... *T. khrustalevi* sp. n.  
- Bursa adanal, male tail end - pin-like ..... 3
3. Length of parasitic female < 0.25 mm .....  
..... *T. reniraoi*  
- Length of parasitic female > 0.25 mm .....  
..... *T. aptini*

## ACKNOWLEDGEMENTS

The research described in this publication was made possible in part by grant N6X300 from the International Science Foundation and Russian Govern-

ment. We are grateful to Dr. Richard zur Strassen, from Forschungsinstitut and Naturkundmuseum Senekenborg, Germany, for his identification of the thrips and to Dr. Dieter Sturhan for constructive criticism and assistance in the preparation of this article. The authors are grateful to Mrs. F.B. Jakovleva for technical assistance.

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Чижов В.Н., Субботин С.А., Захаренкова Н.Н. *Thripinema khrustalevi* sp. n. (Tylenchida: Allantonematidae) - паразит трипсов (Thysanoptera) в Москве.

Резюме. Экземпляры *Thripinema khrustalevi* sp. n. были обнаружены в трипсах (*Thrips trehernei* Prisner and *T. physopus* L.), питающихся в цветках *Taraxacum officinale* Wigg. и *Hieracium* spp. (Compositae), собранных на газонах в Москве. *Thripinema khrustalevi* sp. n. отличается от близких видов *T. aptini* (Sharga, 1932) Siddiqi, 1986 и *T. reniraoi* (Reddy, Nickle & Rao, 1982) различиями в строении бурсы, формой хвоста самца и наличием базальных головок стилета у инвазионных самок, а от *T. nicklewoodi* Siddiqi, 1986 - положением протока дорсальной пищеводной железы у инвазионных самок и отсутствием хвостового конуса у паразитических самок. Электронномикроскопическое исследование стенки тела паразитических самок показало, что они не имеют кутикулы, на поверхности их тела располагаются многочисленные микровилли, закрытые тонким покровным слоем. Приводится определительный ключ для рода *Thripinema*.

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