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TO THE KNOWLEDGE OF PLANT PARASITIC NEMATODES OF DONBASS: *LONGIDORUS* MICOLETZKY, 1922 (DORYLAIMIDA: LONGIDORIDAE)

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As a result of the studies of plant-parasitic nematodes of trees and shrubs on the territory of Donetsk Botanical Garden were recorded two species of *Longidorus* Micoletzky, 1922 (Dorylaimida: Longidoridae): *L. elongatus* (de Man, 1876) has previously been recorded in greenhouses of Donetsk Botanical Garden, *L. leptcephalus* Hooper, 1961 was registered for the first time for Donbass. Both species are polyphagous root ectoparasites. *Longidorus elongatus* was registered in rhizosphere of goat willow (*Salix caprea* L.), and *L. leptcephalus* – in rhizosphere of horse chestnut (*Aesculus hippocastanum* L.). The paper contains descriptions, morphological and morphometric characteristics of recorded populations, trophical associations, and brief data on the distribution, biology, ecology and harmfulness of the species. The morphometrics of the Donbass populations of both species generally are in agreement with literature data, but regional isolates has some differences.

Kew words: plant-parasitic nematodes, Donbass, first record, *Longidorus*, morphometrics

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Introduction

The study of plant-parasitic nematodes is an essential part of modern plant-pathological research. Nematodes are one of the main components of soil ecosystems, and it is important to understand their role in biocenoses, to know trophical relationships and to assess harmfulness level for native and adventive floral components. This communication is a continuation of a series of works, devoted to the study of the fauna of plant-parasitic nematodes of Donbass and contains information about *Longidorus elongatus* (de Man, 1876) Micoletzky, 1922 and *L. leptcephalus* Hooper, 1961 (Dorylaimida: Longidoridae).

Research Aim and Objectives

The aim of the research was to identify the species composition of plant-parasitic nematodes in

green spaces of Donbass. The objectives of research included the description of morphological and morphometric characteristics, elucidation of trophical relationships, initial assessment of populations density and the level of harmfulness of identified species in regional conditions.

Research Objects and Methods

Soil samples were collected in September of 2017 under the trees and shrubs from 0.5 m depth on the territory of Donetsk Botanical Garden (DBG). Nematodes were extracted from soil using the modified Baermann funnel method, killed by heating (70 °C), fixed in triethanolamine formalin water solution (TAF), processed to glycerol by slow evaporation and mounted on microscope slides [5, 13–15]. Images were taken using Canon Power Shot

A 640 camera attached to Carl Zeiss Primo Star microscope, and edited using Adobe Photoshop CS5. Measurements were made with AxioVision Rel. 4.7.

The abbreviations and their definitions for the de Man's ratios and other indices used in tables are as follows: n = number of specimens on which measurements are based, L = overall body length, a = body length divided by its maximum diameter (at vulval region), b = body length divided by the length from anterior to esophago-intestinal valve, c = body length divided by tail length, c' = tail length divided by anal diameter of body, V = ratio between distance from vulva to anterior end of body and total body length in %. All measurements are in μm .

Results and Discussion

As a result of the studies on the territory of Donetsk Botanical Garden were recorded two species of *Longidorus* Micoletzky, 1922 (Dorylaimida: Longidoridae): *L. elongatus* (de Man, 1876) Micoletzky, 1922 and *L. leptcephalus* Hooper, 1961. *Longidorus elongatus* has previously been recorded in greenhouses of DBG [3], *L. leptcephalus* was registered for the first time for Donbass. The following is description, morphological and morphometric characteristics of recorded populations, trophical

associations, and brief data on the distribution, biology, ecology and harmfulness of the species.

Longidorus elongatus (de Man, 1876) Micoletzky, 1922 (Figs. 1A–C)

Measurements: see Table 1.

Description. Female ($n=4$): Body after relaxation spirally curved in open C with a more ventrally curved caudal section, 4900 (4500–5500) μm long (Table 1). Cuticle is smooth. Lip region 13.5 (13–14) μm wide, slightly expanded and flattened, with rounded edges, not separated from the body (Fig. 1A). Amphids are large, with an indistinct base. Stylet long and narrow; odontostyle (90 μm) is almost twice as long as odontophore (53 μm). The distance from oral aperture to guide ring is 30.5 μm . Muscular part of esophagus is 7–8 diameters of its base in length. Vulva in the form of a transverse slit (Fig. 1B). Reproductive system is didelphic-amphidelphic type. Sex tubes with reversed ovaries. Tail is short (49 μm), convex-blunt-conical (Fig. 1C).

Males. Rare. Similar to females. Caudal part of the body is more strongly bent in the ventral direction. Seeds are paired. Spicules paired, relatively thin, ventrally curved. Tail is conical, dorsally convex.

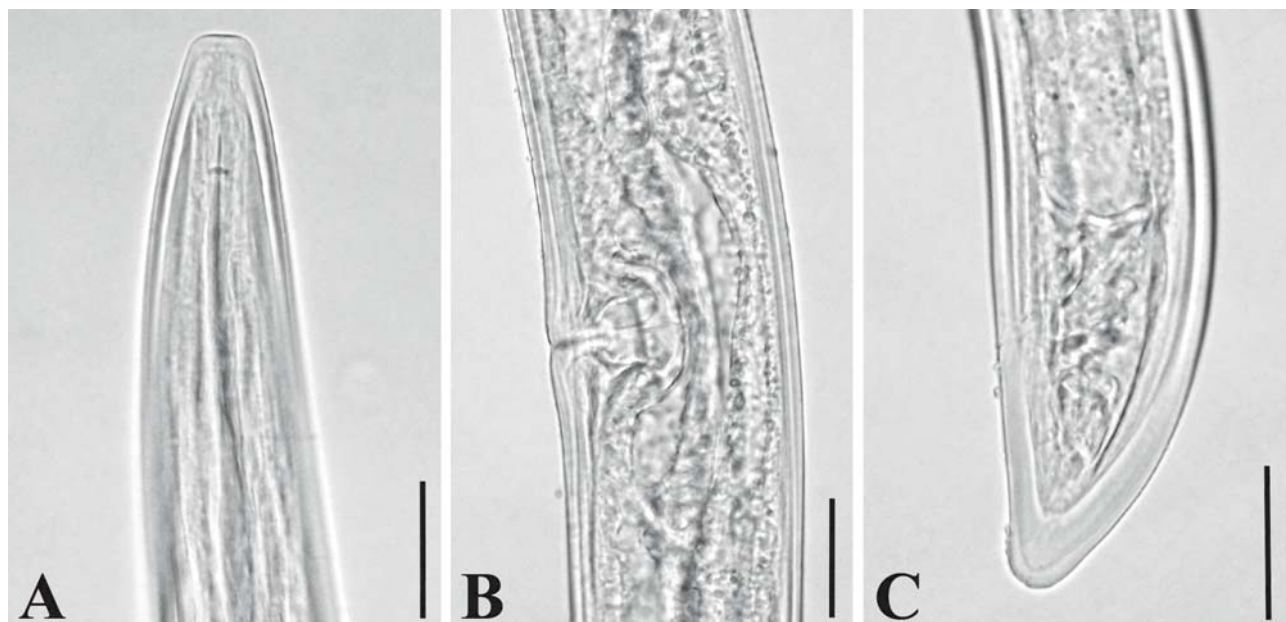


Fig. 1. *Longidorus elongatus* (de Man, 1876) Micoletzky, 1922, female: A – anterior region; B – vulval region; C – posterior region. Scale bar = 30 μm .

Рис. 1. *Longidorus elongatus* (de Man, 1876) Micoletzky, 1922, самка: А – головной конец; В – вульва; С – хвостовой конец. Шкала = 30 μm .

Table 1. Morphometrics of *Longidorus elongatus* (de Man, 1876) Micoletzky, 1922: populations from Czech, Moscow and Donetsk (Donetsk Botanical Garden). All measurements are in μm and in the form: range (mean)

Character	Locality and host		
	Czech, Břeclav, grapevine [8]	Moscow, <i>Urtica dioica</i> L. [12]	Donetsk, DBG, <i>Salix caprea</i> L. [orig.]
n (females)	10	23	4
L	4100–5800 (5000)	4900–6700 (5600)	4500–5500 (4900)
a	68.6–104.2 (86.7)	74–104 (86)	82–87 (84.5)
b	10.0–15.8 (12.8)	10.5–13.6 (12.1)	9.6–12.0 (11.3)
c	100.4–132.7 (118.9)	97–145 (112.2)	98–116 (105.3)
c'	1.06–1.45 (1.22)	1.0–1.4 (1.1)	1.1–1.3 (1.2)
V, %	48.9–60.2 (55)	47–51 (49)	48.3–51.9 (49.9)
Odontostyle	73–81 (77)	90–99 (95)	87–93 (90)
Odontophore	40–48 (44)	38–49 (44)	47–61 (53)
Lip region width	11–12 (12)	–	13–14 (13.5)
Oral aperture to guide ring	26–33 (29)	29–35 (32)	30–31 (30.5)
Body diameter	51–65 (58)	49–78 (67)	55–64 (59)
Tail length	36–48 (42)	38–58 (49)	44–47 (49)

Larvae. Look like adults. Odontostyle is located in front of the esophagus. The tail is narrower and pointed.

The morphometrics of Donbass populations has a little differences in comparison with other populations [4, 8, 12] – first of all lesser body length, and main indexes (Table 1).

Migratory ectoparasite of the root system. Polyphagous, feeds on plants of more than 27 families [16]. Type host is unknown. The most significant damage is done to grain, vegetable, technical, oil, fruit and berry crops. When the helminthes feeds on the roots, necroses and small single galls are formed, as a result of which the growth of the feeding roots stops, developmental delay and dwarfism are observed. Capable of transmitting the Raspberry Ringspot Virus (RRSV), Tomato Black Ringspot Virus (TBRV), Spoon Leaf Virus (SLV), and possibly Clove Ringspot Virus (CRV) [16].

Type locality: Middelburg, Netherlands. Occurs predominantly in temperate latitudes. Widespread in many European countries. Also known from Asia, Africa, North America and Oceania [6, 7, 11]. Widely distributed in Ukraine and Russia, both in open and closed ground.

For the first time in the Donbass, it was found on the territory of open ground in a small number (10

specimens per 100 cm^3 of soil) in the root soil of *Salix caprea* L. The level of damage to the examined plants can be described as «low».

Longidorus leptcephalus Hooper, 1961 (Figs. 2A–C)

Measurements: see Table 2.

Description. Female (n=1): Body after relaxation spirally curved in open C with a more ventrally curved caudal section, 4900 (4500–5500) μm long (Table 2). Cuticle is smooth. Lip region 11 μm wide, slightly rounded, slightly separated from the contours of the body (Fig. 2A). Amphids are large, slightly divided at the base into two lobes. Stylet long and narrow; odontostyle (75 μm) is almost twice as long as odontophore (43 μm). The distance from oral aperture to guide ring is 28 μm . Muscular part of esophagus is 5–6 diameters of its base in length. Vulva in the form of a transverse slit (Fig. 2B). Reproductive system is didelphic-amphidelphic type. Sex tubes with reversed ovaries. Tail is short (44 μm), conical, dorsally curved (Fig. 2C).

Males. Rare. Similar to females. Caudal section of the body is more strongly curved in ventral direction. Odontophore is equal to 2/3 of odontostyle. Testes are paired, extending almost half the length

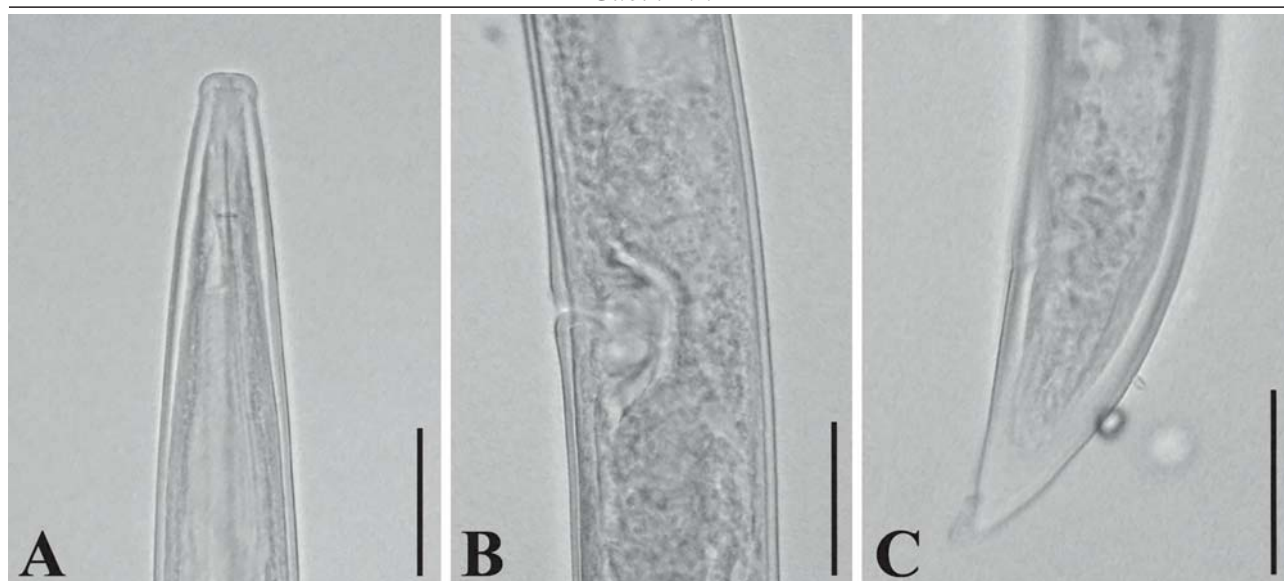


Fig. 2. *Longidorus leptocephalus* Hooper, 1961, female: A – anterior region; B – vulval region; C – posterior region. Scale bar = 30 μm .

Рис. 2. *Longidorus leptocephalus* Hooper, 1961, самка: А – головной конец; В – вульва; С – хвостовой конец. Шкала = 30 μm .

Table 2. Morphometrics of *Longidorus leptocephalus* Hooper, 1961: populations from Czech, Moscow and Donetsk (Donetsk Botanical Garden). All measurements are in μm and in the form: range (mean)

Character	Locality and host		
	Slovakia, [9]	Czech, Vysoké Studnice, pear [8]	Donetsk, DBG, <i>Aesculus</i> <i>hippocastanum</i> L. [orig.]
n (females)	10	31	1
L	3600–4400 (4000)	4300–6100 (5200)	3600
a	70–106 (86)	75.6–116.7 (91.4)	85
b	11.1–15.8 (12.7)	9.4–16.4 (13.8)	9.3
c	95–118 (104)	86.6–148.0 (110.9)	83
c'	1.1–1.6 (1.4)	1.0–1.6 (1.3)	1.7
V, %	49–53 (51)	46.8–60.4 (51.0)	47
Odontostyle	62–65 (64)	59–76 (71)	75
Odontophore	40–48 (43)	35–48 (41)	43
Oral aperture to guide ring	26–31 (29)	27–30 (28)	28
Body diameter	40–54 (47)	47–63 (57)	43
Tail length	34–40 (38)	38–61 (47)	44

of the body. Spicules paired, ventrally curved. Tail is short, conical, dorsally convex.

Larvae. Look like adults. Tail is usually more pointed and elongated.

Migratory ectoparasite of the root system. Polyphagous, feeds on plants of more than 12 families [10, 16]. Type host is unknown. The most

significant damage is done to vegetable and berry crops. When the helminthes feeds on the roots, necroses and small single galls are formed, as a result of which the growth of the feeding roots stops, developmental delay and dwarfism are observed. Capable of transmitting the English strain of Raspberry Ring Spot Virus (RRSV) [16].

Type locality: Rothamsted Experimental Station, Harpenden, Hertfordshire, England. The species is known from the countries of Northern and Central Europe (Great Britain, Denmark, Germany, Ireland, Netherlands, Norway, Slovenia, Czech Republic, Sweden) [1, 2], as well as from certain regions of European Russia (Moscow, Ryazan, Tambov, Belgorod) [10, 16].

First recorded for Donbass. In a small number (2 specimens per 100 cm³ of soil) was recorded only in the root soil of *Aesculus hippocastanum* L.

Conclusions

As a result of the studies of plant-parasitic nematodes of trees and shrubs on the territory of Donetsk botanical garden were recorded two species of *Longidorus* Micoletzky, 1922 (Dorylaimida: Longidoridae): *L. elongatus* (de Man, 1876) Micoletzky, 1922 in rhizosphere of *Salix caprea* L. and *L. leptcephalus* Hooper, 1961 in rhizosphere of *Aesculus hippocastanum* L. *Longidorus elongatus* has previously been recorded in greenhouses of DBG, *L. leptcephalus* was registered for the first time for Donbass. The morphometrics of Donbass populations generally are in agreement with other populations. The level of damage to the examined plants can be described as «low».

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1. Brown D.J.F., Taylor C.E. Comments of the occurrence and geographical distribution of longidorid nematodes in Europe and the Mediterranean region // *Nematologia Mediterranea*. 1987. Vol. 15. P. 333–373.
2. Brown D.J.F., Taylor C.E., Choleva B., Romanenko N.D. The occurrence of Longidoridae (Nematoda: Dorylaimida) in Western USSR with further comments of longidorid nematodes in Europe and the Mediterranean Basin // *Nematologia Mediterranea*. 1990. Vol. 18. P. 199–207.
3. Gubin A.I., Sigareva D.D. Species composition and structure of the communities of plant-parasitic and free-living soil nematodes in the greenhouses of botanical gardens of Ukraine // *Vestnik zoologii*. 2014. Vol. 48, N 3. P. 195–202.
4. Hooper D.J. A redescription of *Longidorus elongatus* (De Man, 1876) Thorne & Swanger, 1936, (Nematoda, Dorylaimidae) and descriptions of five new species of *Longidorus* from Great Britain // *Nematologica*. 1961. Vol. 6, N 3. P. 237–257.
5. Hooper D.J. Handling, fixing, staining and mounting nematodes // *Laboratory methods for Work with Plant and Soil Nematodes* / ed. J.F. Southey. London: Ministry of Agriculture, Fisheries and Food, 1986. P. 59–80.
6. Hunt D.J. Aphelenchida, Longidoridae, and Trichodoridae: their systematic and bionomics. Wallingford: CAB International, 1993. 352 p.
7. Kirjanova E.S., Krall E.L. Plant-parasitic nematodes and their control measures. Moscow: Nauka, 1971. Vol. 2. 552 p. [In Russian]
8. Kumari S., Decraemer W. The genus *Longidorus* (Nematoda: Longidoridae) from Bohemia and South Moravia in the rhizosphere of fruit orchards and vineyards // *Helminthologia*. 2007. Vol. 44, N 4. P. 193–203.
9. Liskova M. The males of *Longidorus leptcephalus* and *Xiphinema italiae* from Slovakia // *Helminthologia*. 1996. Vol. 33, N 2. P. 87–92.
10. Rogozhin E.A. Pathogenicity of the nematode *Longidorus leptcephalus* towards berry plants in vegetative environments // *Visnyk of Dnipropetrovsk University. Biology, ecology*. 2013. Vol. 21, N 2. P. 101–104. [In Russian]
11. Romanenko N.D. Phytohelminths – virus carriers of the family Longidoridae Moscow: Nauka, 1993. 284 p. [In Russian]
12. Rubtsova T.V., Chizhov V.N., Subbotin S.A. *Longidorus artemisiae* sp. n. (Nematoda: Longidoridae) from roots of *Artemisia* sp., Rostov region, Russia // *Russian Journal of Nematology*. 1999. Vol. 7, N 1. P. 33–38.
13. Santos M.S.N.A., Abrantes I.M.O. Morphological characters and methods for preparing nematodes // *Nematode Identification and Expert System Technology* / ed. R. Fortuner. NY: Plenum Press, 1988. P. 201–215.
14. Seinhorst J.W. A rapid method for the transfer of nematodes from fixative to anhydrous glycerin // *Nematologica*. 1959. Vol. 4, N 1. P. 67–69.

15. Southey J.F. Laboratory methods for work with plant and soil nematodes. London: Her Majesty's Stationery Office, 1970. 148 p.
16. Zinovieva S.V., Chizhov V.N., Pridannikov N.V., Subbotin S.A., Ryss A.Y., Khusainov R.V. Plant parasitic nematodes of Russia. Moscow: KMK Scientific Press, 2012. 386 p. [In Russian]

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**К ИЗУЧЕНИЮ ФИТОПАРАЗИТИЧЕСКИХ НЕМАТОД ДОНБАССА:
LONGIDORUS MICOLETZKY, 1922 (DORYLAIMIDA: LONGIDORIDAE)**

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В результате изучения фитопаразитических нематод древесно-кустарниковых растений на территории Донецкого ботанического сада были зарегистрированы два вида рода *Longidorus* Micoletzky, 1922 (Dorylaimida: Longidoridae): *L. elongatus* (de Man, 1876) ранее отмечался в теплицах ДБС, *L. leptcephalus* Ноорег, 1961 зарегистрирован впервые для Донбасса. Оба вида являются корневыми эктопаразитами. *Longidorus elongatus* отмечен в ризосфере ивы козьей (*Salix caprea* L.), *L. leptcephalus* – в ризосфере конского каштана (*Aesculus hippocastanum* L.). В статье приведено описание, морфологические и морфометрические характеристики гельминтов из зафиксированных популяций, сведения о трофических связях, а также краткие данные по распространению, биологии, экологии и вредоносности видов. Морфометрические показатели популяций из Донбасса в целом согласуются с литературными данными, но региональные изоляты имеют ряд отличий.

Ключевые слова: фитопаразитические нематоды, Донбасс, первое указание, *Longidorus*, морфометрия

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