

First report of a bacteriovorous nematode, *Diploscapter coronatus* (Cobb, 1893) Cobb, 1913 (Rhabditida: Diploscapteridae), in Korea

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Diploscapter coronatus (Cobb, 1893) Cobb, 1913 was first reported on oriental melon (*Cucumis melo* vars. *makuwa* Makino) roots from plastic film houses, Gyeongsangbuk-do, Andong, Korea (latitude N36°33'. longitude E128°29'). *Diploscapter coronatus* is most similar to *D. pachys*. Species in the genus *Diploscapter* have a visibly annulated cuticle. The stoma of *D. coronatus* is 1.5 times longer than the lip region width. The pharyngeal corpus is clearly separated from the isthmus and the vulva is situated around the mid-body. However, it differed by higher ratio of "a", filiform tail and had relatively blunt labial hooks. The Korean population is well matched and within the range of *D. coronatus* as described from Iran and Ethiopia in de Man's of L, b, c, c', and V. Female length, however, varied between populations: the Ethiopia population female length is longer than in the Korea population (396.4 vs 427.0) while females in the Iran population are smaller than in the Korea population (396.4 vs 350.0). Nematode size may vary due to environmental conditions such as food sources. The position of excretory pores in the Korean population were shorter 53.9-72.5 than in other populations (67-82 and 70-89). Males were uncommon. Males in the Korean population are smaller than females but larger (356.0) than males in the Indian population (306.0).

Keywords: Bacterivorous nematode, *Diploscapter coronatus*, Diploscapteridae, Rhabditida, South Korea

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INTRODUCTION

Diploscapter, a free-living nematode, is commonly found in the rhizosphere of agricultural soil (Siddiqi, 1998; Gibbs *et al.*, 2005). *Diploscapter coronatus* was first described by Cobb (1893) from the rhizosphere of banana plants in Fiji using the name *Rhabditis coronata* then later transferred to the genus *Diploscapter* (Cobb, 1913). Identification of *Diploscapter* species is based on particular morphological characteristics including cuticularized hook-like appendages together with rhabditoid types of oral cavities as well as an absence of glottoid apparatus and bursa with seven pairs of papillae (Chitwood and Chitwood, 1950; Bird, 1971; Skryabin, 1992; Morimoto *et al.*, 2006). Sixteen species have been assigned to the genus: *D. angolaensis* Siddiqi, 1998; *D. cannae* Rahm, 1928; *D. cornutus* (Siddiqi, 1998) Sudhaus, 2011; *D. coronatus* (Cobb, 1893) Cobb, 1913; *D. cylindricus* Rahm, 1929; *D. indicus* Tahseen, Siddiqi & Rowe, 2002; *D. lycostoma* Völk, 1950; *D. libycus* Penso, 1938; *D. nodifer* Milhelcic, 1953; *D. orientalis* Kannan,

1960; *D. pachys* Steiner, 1942; *D. rhizophilus* Rahm, 1928/29; *D. striatus* Siddiqi, 1998; *D. tentaculatus* (Carter, 1859) Sudhaus, 2011; *D. tokobaevi* Lemzina & Gagarin, 1994; and *D. formicidae* (Zhao *et al.*, 2013). The genus also contains species that are facultative parasites of humans and other animals (Chandler, 1938; Morimoto *et al.*, 2006; Zhao *et al.*, 2013).

During a survey of soil nematodes in Korea, an unreported species of bacterivorous nematodes belonging to the genus of *Diploscapter* was isolated from oriental melon (*Cucumis melo* vars. *makuwa* Makino) roots grown in green houses, Andong, Gyeongsangbuk-do, Korea (latitude N36°33'. longitude E128°29').

MATERIALS AND METHODS

Soil samples were collected from oriental melon roots in plastic film houses, Andong, Gyeongsangbuk-do, Korea (latitude N36°33'. longitude E128°29'). Nematodes were extracted from soil using a modified Baermann's

funnel method. Extracted nematodes were fixed with 80°C FG 4:1 fixative (Southey, 1986) and transferred to glycerin according to the Seinhorst's rapid method (Seinhorst, 1959). For light microscopic observations, specimens were mounted on Cobb's slides and sealed with a paraffin ring and glycerin (Cobb, 1917). Nematodes were observed, measured and photographed with the aid of a compound microscope (Olympus, BX53) equipped with digital camera (DP73, Olympus). Morphometrics included de Mans indices with measurements. Raw photographs were edited using Adobe Photoshop software.

SYSTEMATIC ACCOUNTS

Diploscapter coronatus (Cobb, 1893) Cobb, 1913

Galgori-gupeun-ipsul-seonchung (New Korean name) (Figs. 1, 2)

Syn.

Rhabditis coronata Cobb, 1893

Rhabditis bicornis Zimmermann, 1898

Diploscapter bicornis (Zimmermann, 1898) Goodey, 1963

Rhabditis cephaloides Stefański, 1922

Acrobeles armatus Kreis, 1929.

Order Rhabditida Chitwood, 1933 Ganseonchung-mok

Family Diploscapteridae Micoletzky, 1922

Gupeun-ipsul-seonchung-gua (New Korean name)

Subfamily Diploscapterinae Micoletzky, 1922

Gupeun-ipsul-seonchung-agua (New Korean name)

Genus *Diploscapter* Cobb, 1913

Gupeun-ipsul-seonchung-sok (New Korean name)

Measurements.

Korea population

Female (n = 7): L = 396.4 (299.1-482.9) μm ; a = 18.8 (17.7-20.6); b = 4.3 (3.8-4.9); c = 7.4 (6.3-8.1); c' = 4.7 (4.3-5.4); V = 55.9 (53.9-59.8); tail = 53.7 (47.3-61.6) μm ; body diameter = 21.25 (14.5-26.57) μm ; excretory pore = 67.7 (53.9-72.5) μm .

Male (n = 1): L = 356.4 μm ; a = 15.2; b = 3.8; c = 18.1; c' = 1.3; tail = 19.7 μm ; spicule = 19.9 μm ; gubernaculum = 8.9 μm ; body diameter = 23.5 μm ; excretory pore = 71.0 μm .

Ethiopia population by Eyualem (1998)

Female (n = 20): L = 427 (395-480) μm ; a = 17.7 (15.8-19.8); b = 4.0 (3.6-4.1); c = 7.8 (6.3-9.2); c' = 4.9 (4.1-6.5); V = 53.2 (50.0-55.7); tail = 55.5 (45.0-71.0) μm ; body diameter = 24.3 (21.0-28.0) μm ; excretory pore = 79.0 (70.0-89.0) μm .

Iran population by Eyualem (1998)

Female (n = 20): L = 350 (317-403) μm ; a = 16.2 (15.5-17.0); b = 4.0 (3.7-4.4); c = 7.0 (5.8-9.6); c' = 5.3 (3.5-6.1); V = 53.7 (50.1-58.4); tail = 51.0 (36.0-67.0) μm ; body diameter = 21.7 (20.0-25.0) μm ; excretory pore = 75.1 (67.0-82.0) μm .

India population by Shah and Vaid (2015)

Male (n = 2): L = 306 (284-326) μm ; a = 16 (15.0-16.0); b = 3.6 (3.5-3.6); c = 15.2 (14-16); c' = 1.2 (1.0-1.3); tail = 19.5 (19.0-20.0) μm ; spicule = 21.8 (20-23) μm ; gubernaculum = 9.5 (9.0-10.0) μm ; body diameter = 19.0 (18.0-19.5) μm ; excretory pore = 72.0 (71.0-73.0) μm .

Description. Female. Body after fixation almost straight of slightly undulated, largely cylindrical, tapering towards the posterior end and maximum body width occurring near the vulva. Pharyngeal corpus clearly separated from isthmus. Vulva situated around mid-body and stoma longer than 1.5 times lip region width. Tail straight, conoid anteriorly, filiform posteriorly, only supplied with somatic muscle tissue until mid-length, cuticular in the posterior half of its length. Male. Body straight on fixation. Cuticle transversely striated. Longitudinal striations absent. Labial region off-set, dorsal and ventral lips modified into cuticularized hook-like appendages. Procorpus muscular and terminal bulb well developed. Testis single, ventrally reflexed. Spicule separate. Gubernaculum simple almost straight, slightly curved at the proximal end. Tail short, conoid and bursa with seven pairs of bursal papillae.

Material examined. Soil around oriental melon roots in plastic film house, Andong, Gyeongsangbuk-do, Korea.

Distribution. Korea (new record), Ethiopia, Fiji, India, Iran, Japan, South Africa, Spain, Thailand.

Remarks. *Diploscapter coronatus* is most similar to *D. pachys*. These species have a visibly annulated cuticle. Stoma of *D. coronatus* is longer than 1.5 times lip region width. Pharyngeal corpus is clearly separated from isthmus and vulva is situated around mid-body. However, it differed by having a higher ratio of "a" filiform tails and relatively blunt labial hooks. The Korean population is well matched and within the range of *D. coronatus* described from Iran and Ethiopia (Eyualem *et al.*, 1998) in de Man's indices of L, b, c, c', and V. Female length, however, varied between populations: Ethiopia populations have larger females than Korea populations (396.4 vs 427.0) while in Iran populations females are smaller than in Korea populations (396.4 vs 350.0). The size of nematodes may vary due to environmental conditions such as food sources. Position of excretory pores in the Korean population were shorter 53.9-72.5 than other populations (67-82 and 70-89). Males are uncommon. Males in the Korea population were smaller than females but larger (356.0) than males in the Indian population (306.0) (Shah and Vaid, 2015).



Fig. 1. *Diploscapter coronatus* (Cobb, 1893) Cobb, 1913. A. Entire body of female; B. Posterior part of female; C. Anterior part of female; D. Tail region with spicule of male and E. Entire body of male. Scale bars: A = 50 μ m; B-D = 20 μ m; E = 50 μ m.

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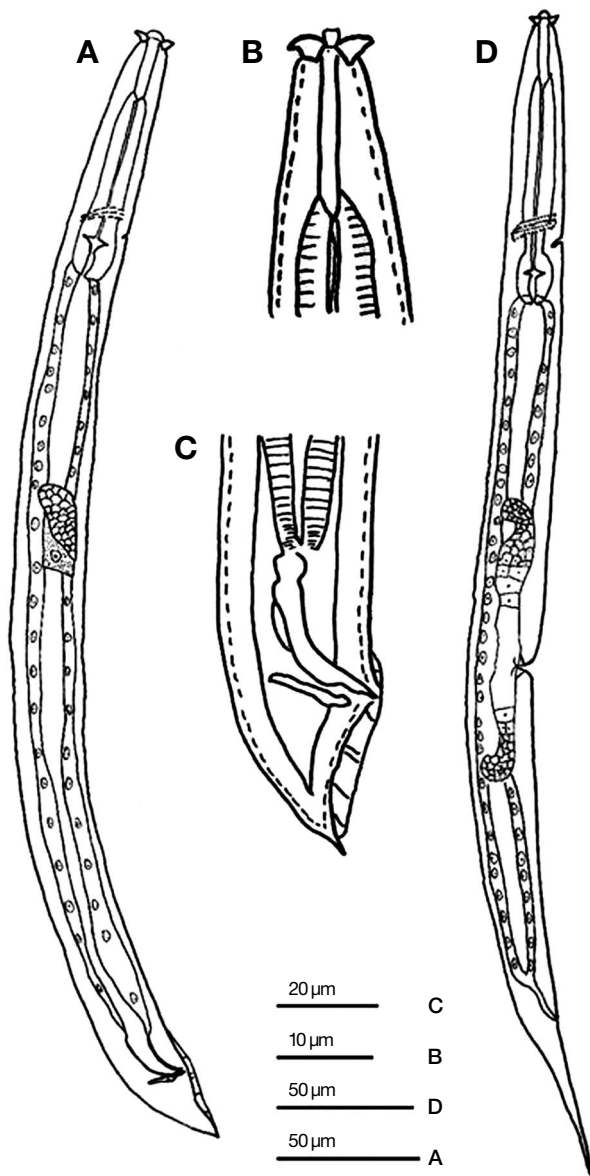


Fig. 2. Line drawings of *Diploscapter coronatus* (Cobb, 1893) Cobb, 1913. A. Entire body of male; B. Anterior part of female; C. Tail region of male and D. Entire body of female.

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