

Short Communication

First Record: A Stem and Bulb Plant Parasitic Nematode at Garlic Area Centre Temanggung, Central Java, Indonesia with Species Reference to *Ditylenchus dipsaci*

Catatan Pertama: Nematoda Parasit Batang dan Umbi pada Sentra Bawang di Temanggung, Jawa Tengah, Indonesia yang Mengarah ke Spesies Ditylenchus dipsaci

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ABSTRACT

A survey to investigate the stem and bulb plant parasitic nematode at one of garlic area centre, in Temanggung, Central Java, Indonesia was conducted from January to February 2018. Infected plant with specific symptoms, morphological and morphometric characters both of female and male of adult nematodes were used to describe a A1 quarantine plant parasitic nematode *Ditylenchus dipsaci*. Seven from nine observed locations were positively infected with population in average 2.67 nematodes per 100 g of soil and 2.67–189.33 per bulb. This is the first report of *D. dipsaci* from Indonesia and consequently further investigations were needed to know their distribution and also to confirm the origin of the nematode.

Keywords: a bulb nematode, garlic, new report

INTISARI

Survei keberadaan nematoda parasit batang dan umbi dilakukan pada bulan Januari–Februari 2018 pada satu sentra penangkaran bawang putih di Temanggung, Jawa Tengah, Indonesia. Tanaman terinfeksi dengan gejala serangan yang spesifik, karakter morfologi dan morfometri nematoda betina dan jantan dewasa dipergunakan dalam identifikasi *Ditylenchus dipsaci* yang merupakan nematoda parasit tanaman yang termasuk OPTK A1 (Organisme Pengganggu Tanaman Karantina A1) di Indonesia. Sebanyak tujuh dari sembilan lokasi yang diamati mengindikasikan positif sebagai daerah sebaran nematoda tersebut dengan populasi rata-rata 2,67 ekor per 100 gram tanah dan 2,67–189,33 nematoda per umbi. Laporan pertama tentang nematoda *D. dipsaci* ini membawa konsekuensi perlunya penelitian lebih lanjut untuk mengetahui daerah sebaran dan juga konfirmasi dari mana nematoda tersebut berasal.

Kata kunci: bawang, laporan pertama, nematoda umbi

INTRODUCTION

A stem and bulb nematodes, *Ditylenchus dipsaci* (Tylenchida: Anguinidae), are a destructive plant parasitic nematode of many vegetables, especially of garlic and onion. They attack mainly on the root, tubers and stems of the host plant. Heavily attacked plants cause stunted growth, yellowing and twisting leaves and defoliation and effect to crop losses of 60–80%. The infected onion bulbs are also a means of spreading the nematodes becoming more widespread (Yavuzaslanoglu *et al.*, 2015). The stem and bulb nematode *Ditylenchus dipsaci* has placed on the Quarantine Pest A1 List in Indonesia and it is regulated as a quarantine pest.

Life cycle of *D. dipsaci* average in 19–23 days. Mature females deposit eggs during 20–50 days and about 10 eggs/day. Under favorable conditions, the second stage juveniles hatch from the eggs and undergo two molts become the fourth juveniles and infective stage. These juveniles can penetrate and feed on young tissues of leaves, stems, bulbs, and other plant parts, but generally not roots. The fourth-stage juveniles go through the fourth molt and differentiate into mature males and females and may complete several generations in the succulent cells of the cortex layer of leaf or bulb tissues of garlic and onions. The fourth-stage juveniles of *Ditylenchus* sp. are known to withstand desiccation conditions,

their condition make they survive for several years in the dry state in infected plant tissues or free in soil. Stem and bulb nematodes can spread mainly by infected seeds and planting materials, contaminated equipment, and other means of transporting infested soil. Economic thresholds of *D. dipsaci* are very low, each 10 nematodes per 0.5 kg of soil may caused to significant crop losses (Subbotin *et al.*, 2005). Observation of the presence of stem and bulb nematode in Indonesia should be undertaken in an attempt to anticipate nematode attacks and in support to the national program of onion production

MATERIALS AND METHODS

Observation and Nematodes Analysis

Observation was conducted in seed breeding areas in Temanggung, Central Java, Indonesia. Plants with exhibited specific symptoms of nematode damage such as leaf yellowing, declining and poor development plant were collected. Nematode samples were analyzed from soil rizhosphere, bulbs plant and infected roots. Isolation and extraction of nematode from both of soil and plant material were done by using Whitehead tray method modification referring to Southey (1986).

Nematode Identification

Identification was done based on morphological and morphometry characters of nematodes. Male dan female adult specimens for microscopic observation were killed by gentle heat, fixed in FAA solution according to Seinhorst's method (Hooper, 1986). Specimens were observed by light microscope Olympus CX 31 with magnification 40–1000×.

Measurements and drawings of specimens were made using a *camera lucida* which connected to microscope Olympus BH2. The observation of morphological and morphometrical of each specimen was done and referenced to related published data for identification to species level.

RESULTS AND DISCUSSION

The observation showed that the stem and bulb nematodes were found and attacks some varieties of garlic. Seven from nine location of garlic plantation were positively infected by these nematodes (Table 1). Infected plants of garlic showed yellowing, stunting and twisting symptoms (Figure 1). Growth reduction was also observed in infested fields (Figure 1C).

Infested bulbs are necrotic and tend to be rot with dark to black colour and its become soft. *D. dipsaci* for the first time found in garlic plantation in Temanggung, Central Java, Indonesia. Observation showed *Ditylenchus dipsaci* attacked were distributed on some location (Table 1). The population are range in average 2.67 nematodes per 100 g of soil and 2.67–189.33 per bulb. Nematode *D. dipsaci* is found at various altitudes and infects some varieties of garlic. The existence of the nematode is long time enough. As the same with the existence of potato cyst nematodes case in Indonesia (Indarti *et al.*, 2004), these nematode already established for several years and bulbs possible to carry the imported seeds. Therefore, it's needed further study to know the origin of these nematodes.

Morphological observation: Body straight when relaxed. Head continuous with adjacent body with sclerotization (Figure 3A and 4C). Length of stylet

Table 1. Population of *Ditylenchus dipsaci* nematodes on some garlic cultivars and locations

Location	Altitude (a.s.l)	Cultivar	Population	
			Each 100 g of soil	Each Bulb
Tegal, Petarangan	1,202	Lumbu Kuning	2.67	0
Cepit 1, Petarangan	1,598	Lumbu Kuning	0	8.00
Cepit 2, Petarangan	1,598	China	2.67	18.67
Sungkabek, Petarangan	1,408	Lumbu Kuning	13.33	189.33
Si Pending, Petarangan	1,560	Tawang mangu	5.33	16.00
Gagah Ombo, Petarangan	1,285	Lumbu Kuning	2.67	42.67
Paparingan, Ketekan, Ngudirejo	1,382	Tawang mangu	0	0
Wadungan Gunung 1, Kledung	1,284	Lumbu Kuning	2.67	0
Wadungan Gunung 2, Kledung	1,284	Lumbu Kuning	0	0



Figure 1. Symptoms caused by *Ditylenchus dipsaci*: (A) infected bulb; (B) leaf distortion and discoloration; (C) stunting of infected plant

10–12 μm females or 10–12 μm in males. Knob stylet rounded and well developed (Figure 3A.1) Median bulb muscular, with thickenings of lumen walls and clearly (Figure 3A.2). Basal bulb offset or a little overlapping with intestine (Figure 2A.3). Bursa envelops three-quarters of the tail in males (Figure 4A.2). Spicules clearly and terminus tail of both females and males tend to tapering-conoid (Figure 2B.2; 3 B.2 and 4A.2). The morphological character of these nematodes are in accordance with the criteria of *Ditylenchus dipsaci* (EPPO, 2013, Anonymous, 2015; Anonymous, 2017)

Morphometric measurements of *D. dipsaci* for females ($n = 8$), were: $L = \pm 1,06.1$ (972.2 to 1,229.5) μm , $a = 34.8$ (33.5 to 41.8), $b = 6.2$ (5.3 to 6.8), $c = 11.1$ (9.1 to 12.8), and stylet 10.1 (8.9 to 11.2) μm . For males ($n = 4$), $L = 1,589.2$ (1,494 to 1,702.7) μm , $a = 43.0$ (40.7 to 46.0), $b = 6.9$ (6.4 to 7.1), $c = 11.4$ (9.2 to 12), with stylet 10.4 (10 to 11.8) μm . Refer to EPPO (2013), the morphometric values is in convenient with the criteria of *Ditylenchus dipsaci*.

Based on symptoms of infected garlic, nematode morphological characters of both female and male and also were supported with morphometric data, it's conclusion that species of plant parasitic nematodes which infect garlic in Temanggung, Central Java, Indonesia is *Ditylenchus dipsaci*.

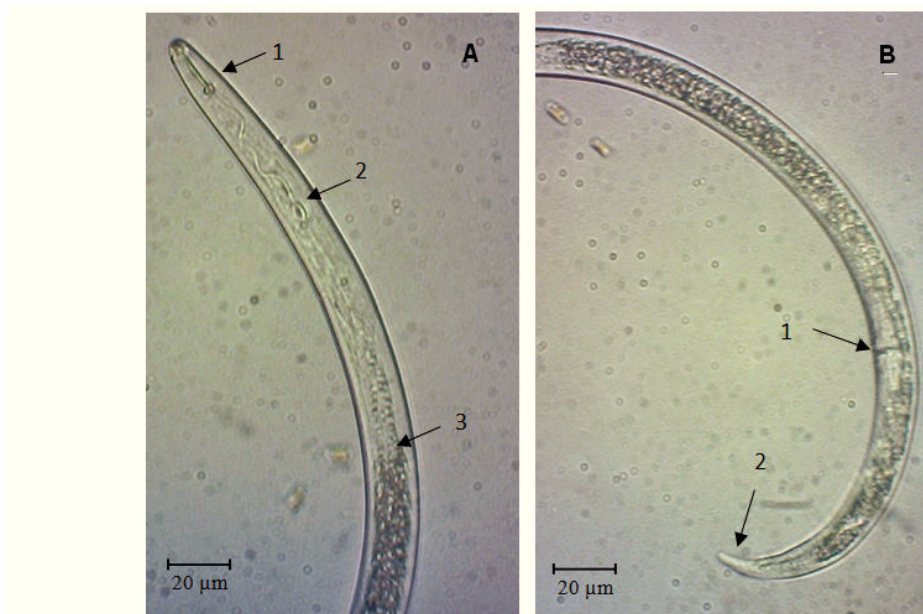


Figure 2. Female of *Ditylenchus dipsaci* 400 \times magnification; (A) Anterior region: (1) stylet, (2) metacarpus, (3) basal bulb of usophagus slighly overlap with intesinum; (B) Posterior region: (1) vulva position, (2) tail tip

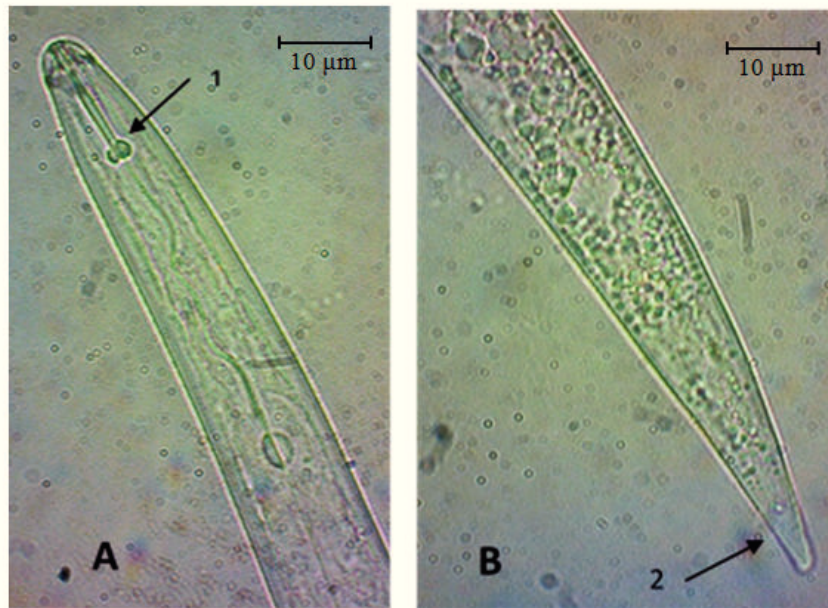


Figure 3. Female of *Ditylenchus dipsaci* 1000× magnification; (A) anterior region: (1) stylet, with knob; (B) posterior region: (2) tail tip of mature female with specific character

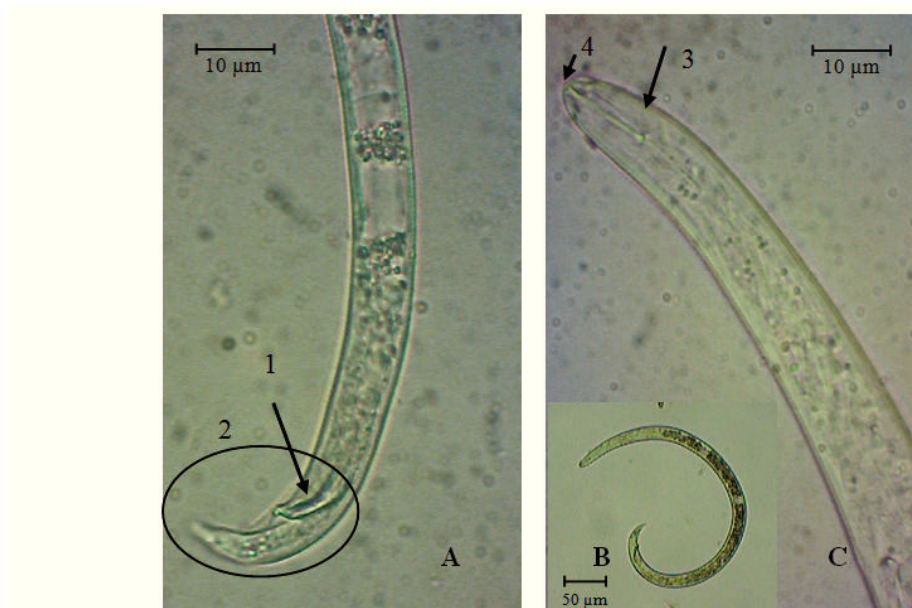


Figure 4. Adult male of *Ditylenchus dipsaci* (A and C in 1000× magnification); (A) posterior end of male: (1) spicula, (2); (B) male (magnification 100×); (C) anterior end: (3) stilet, (4) flat lip

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