African Journal of Microbiology Research Vol. 6(1) pp. 203-205, 9 January, 2012
Available online at http://www.academicjournals.org/ajmr
DOI: 10.5897/AJMR11.356
ISSN 1996-0808 ©2012 Academic Journals

Short Communication

First report of an unrecorded nematode-trapping fungus species *Dactylellina candidum* in Korea

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Accepted 30 July, 2011

***Dactylellina candidum*, a fungus that captures nematodes by means of non-constricting rings and stalked adhesive knobs, was isolated from rotten wood in the Euiseong area, South Korea. This fungus produces 1–3 fusiform or clavi-fusiform conidia, which are 2–4-septate (mainly 4-septate) and sized 36.0–45.4 × 7.3–9.7 µm (L × W), at the conidiophore apex. This is the first report of *Dactylellina candidum* in Korea. This fungus should be considered a potential biological control agent for plant-parasitic nematodes.**

Key words: *Dactylellina candidum*, nematode-trapping fungus, non-constricting rings, stalked adhesive knob, unrecorded species.

INTRODUCTION

Since the phenomena of capture and destruction of nematode by *Arthrobotrys* revealed by Zopf, subsequently many nematode-destroying fungi were isolated. Nematologists had identified nematode-destroying fungi, including predatory and endoparasitic (Barron, 1977). Some potential biological control agents for nematodes have been extensively reviewed and applied to control nematode in soil (Sayre and Walter, 1991; Sikora, 1992; Zhang et al., 2008).

The main objective of this study was to describe morphological characters of a potential fungus, which was collected during survey of bio-control fungi for plant-parasitic nematodes in Korea in 2009.

MATERIALS AND METHODS

Rotten wood was sampled, crushed, and passed through a 1 mm-diameter testing sieve. A modified sprinkling-baiting technique was used to isolate the nematode-trapping fungi (Barron, 1977). Rotten wood powder (approximately 0.5 g) was sprinkled onto a petri plate (diameter, 10 cm) containing 1.7% corn meal agar (CMA; Difco) and 2% water agar (WA), and approximately 200 nematodes (*Rhabditis* spp.) were added to the surface of the petri dish as bait for the nematode-trapping fungi. Two CMA plates and 2 WA plates were used for each sample. The plates were incubated for 2–4 weeks at 25°C and were examined every other day under a dissecting microscope (Olympus SZ×12) to detect the appearance of nematode-trapping fungi. When a nematode-trapping fungus was detected, it was photographed using an attached digital camera (Nikon DXM1200F) and transferred to a CMA plate to obtain pure cultures. This nematode-trapping fungus was identified as *Dactylellina candidum*.

RESULTS AND DISCUSSION

The taxonomic revisions of this species are given below:

Dactylellina candidum

- 1. *Dactylium candidum* Nees, Syst. Pilze Schw., 58. 1817. (Nees von Esenbeck, 1816, 1817).
- 2. *Dactylaria candida* (Nees: Fr) (Saccardo, 1886).
- 3. *Candelabrella candida* (Nees: Fr) (Rifai, 1968).
- 4. *Arthrobotrys candida* (Nees: Fr) (Schenck et al., 1977).

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Table 1. Comparison of the *Dactylellina candidum* isolates from Korea with the original description and its closely related species *Monacrosporium lysipagum* (Drechsler, 1937).

Character		Korea isolate	Original description	Closely related species
			D. candidum	***M. lysipagum***
Conidiophores	Length (µm)	184.7 (141.2-220.8)	150-300	125-250
Conidia	Length (µm)	39.5 (36.0-45.4)	Mostly 30.0-45.0 (26.0-52.0)	40.7 (28.0-55.0)
	Width (µm)	8.5 (7.3-9.7)	Mostly 7.0-10.0 (5.5-11.5)	11.6 (9.0-14.0)
	Shape	Clavate-fusoid to fusoid	Clavate-fusoid to fusoid	Obovoid-fusoid
	Septa	4 (2-4)	4 (2-6)	4 (2-4)
Knob stalk	Length (µm)	13.9 (5.4-15.8)	4.0-15.0	5.0-35.0
Knob	Length (µm)	6.4 (4.3-7.5)	4.0-7.0	5.0-8.0
	Width (µm)	6.2 (4.5-7.6)	3.8-6.0	4.5-6.0
Ring stalk		18.4 (7.0-38.2)	10.0-35.0	5.0-8.0
Ring	Outside diameter	17.4 (14.6-21.9)	15.0-23.0	13.0-23

5. *Dactylella candida* (Nees: Fr) (De Hoog and Van Oorschot, 1985).
6. *Monacrosporium candidum* (Nees: Fr) X.Z. (Liu and Zhang, 1994).
7. *Dactylellina candidum* (Nees: Fr.) (Li et al., 2005).

This species was first reported by Nees von Esenbeck (1817) and then by Saccardo (1886). It was originally described in detail by Drechsler (1937) after isolation from nematode-infested agar to which leaf mold had been added. The mycelium was somewhat delicate, 1.2–3.0 µm wide, especially in the presence of nematodes, and formed a predacious apparatus, unicellular knobs, and non-constricting rings. The knobs, which are globose or prolately ellipsoidal in shape, and mainly 4–7 µm in length, and 3.8–6 µm in width, are supported on slender stalks that are 4–15 µm long and 1–1.4 µm wide. The rings, with an outside diameter of 15–23 µm, are generally composed of 3 arcuate cells that are 2.5–5 µm wide, and the proximal segments, where the rings join the stalk, are often noticeably inflated. The stalks are frequently circinate or otherwise curved and are 10–35 µm in length and 1.2–1.8 µm in width. The conidiophores are approximately 3–5 µm wide at the base, gradually taper upward to a width of approximately 1.3–2.4 µm at the tip, usually rise to a height of 150–300 µm or even 400 µm above the substratum, are simple but occasionally branched, and bear 3–10 conidia in a strikingly capitate arrangement. The conidia vary in shape from clavate-fusoid to fusoid and are 26–52 µm in length (mostly 30–45 µm) and 5–11.5 µm in width (mostly 7–10 µm). The conidia are 2–6-septate (usually 4-septate).

A fungus subsequently identified as *D. candidum* was isolated from rotten wood in the Euiseong area, Korea.

The fungus produces 1–3 clavate-fusoid to fusoid conidia, sized 36.0–45.4 × 7.3–9.7 µm (L × W), on the conidiophore apex on CMA (Table 1). The shape of the conidia (Figure 1A, B), non-constricting rings, stalked adhesive knobs (Figure 1D, E) and the trapped nematodes (Figure 1C, F) were consistent with the original description of *D. candidum* (Table 1).

Drechsler (1937) observed that the stalked knobs are rarely operative, and only in the capture of the smallest and feeblest nematodes. This phenomenon was also observed in this study. However, we also found that a higher proportion of stalked knobs were produced on WA than on CMA. The fungus was identified as *D. candidum* mainly because its conidia were less wide than those of its closely related species *M. lysipagum* (Drechsler, 1937); the conidia of *D. candidum* are 5.5–1.5 µm wide (mostly 7.0–10.0 µm), while those of *M. lysipagum* are 9–14 µm wide (average, 11.6 µm). The fungus isolated in this study produced conidia that were 7.3–9.7 µm wide (average, 8.5 µm). On the other hand, 6-septate conidia were not found in this fungus. Historically, this species was reported in the older literature (1816, 1837) and was described as producing 3- and 4-septate conidia. Later, Peach (1950) described *Dactylaria candida* (Nees) Saccardo as follows: the conidia are slender, septate, 30–50 µm in length, 6–10 µm in diameter, and commonly 5 –celled.

ACKNOWLEDGEMENTS

This study was sponsored by Special Fund for Agro-scientific Research in the Public Interest (200903040, 201103001), the Technology Program of the Higher Education Institutions of Shandong Province (J11LC23), and the Korean-China Scientist (Post-doc.) Exchange Program.

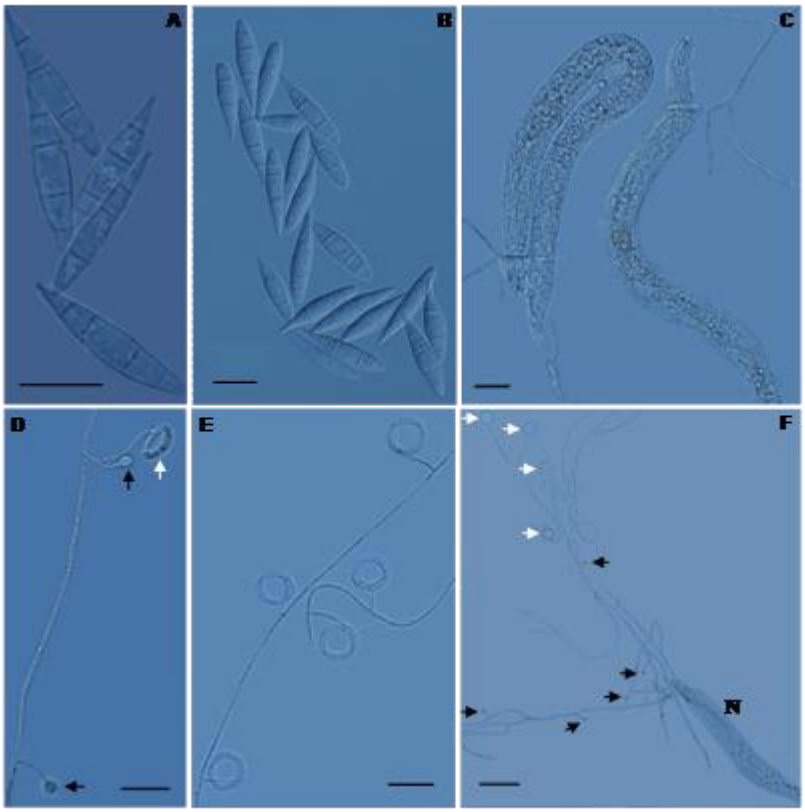

Figure 1. *D. candidum.* A, B. Conidia, C. Nematode captured by non-constricting rings, D. non-constricting ring and stalk adhesive knobs, E. non-constricting rings, F. non-constricting rings, stalk adhesive knobs and partially digested nematode captured by stalk adhesive knob (rings indicated by white arrows, stalk knobs indicated by black arrow and N stand for nematode captured and partially digested). Bars = 20 µm (A, B, C, D, E) and 50 µm (F).

REFERENCES

Barron GL (1977). Tropics in Mycobiology No. 1. Nematode-destroying fungi. Canadian Biological Publications, Guelph, Ontario, Canada. pp.140.

De Hoog, GS, Van Oorschot CAN (1985). Taxonomy of the *Dactylaria* complex VI. Key to the genera and check-list of epithets. Stud. Mycol., 26:97-122.

Drechsler C (1937). Some hyphomycetes that prey on free-living terricolous nematodes. Mycologia, 29:446-552.

Liu XZ, Zhang KQ (1994). Nematode-trapping species of *Monacrosporium* with special reference to two new species. Mycol. Res., 98:862-868.

Li Y, Hyde KD, Jeewon R, Cai L, Vijaykrishna D, Zhang K (2005). Phylogenetics and evolution of nematode-trapping fungi (Orbiliales) estimated from nuclear and protein coding genes. Mycologia, 97:1034-1046.

Nees von Esenbeck CG (1817). Das System der Pilze und Schwämme. In Drechsler C (1937). Some hyphomycetes that prey on free-living terricolous nematodes. Mycologia, 29:526.

Peach M (1950). Aquatic predacious fungi. Trans. Brit. Mycol. Soc., 33:148-153.

Rifai MA (1968). The hyphomycete genus *Dactylaria* Sacc. Reinwardtia, 7:357-374.

Saccardo PA (1886). Sylloge fungorum 4. In Drechsler C (1937). Some hyphomycetes that prey on free-living terricolous nematodes. Mycologia, 29:526.

Sayre RM, Walter DE (1991). Factors affecting the efficacy of natural enemies of nematodes. Annu. Rev. Phytopathol., 29:149-166.

Schenck NC, Kendrick WB, Pramer D (1977). A new nematode-trapping hyphomycete and a reevaluation of *Dactylaria* and *Arthrobotrys*. Can. J. Bot., 55:977-985.

Sikora RA (1992). Management of the antagonistic potential in agricultural ecosystems for the biological control of plant-parasitic nematodes. Annu. Rev. Phytopathol., 30:245-270.

Zhang L, Yang E, Xiang M, Liu X, Chen S (2008). Population dynamics and biocontrol efficacy of the nematophagous fungus *Hirsutella rhossiliensis* as affected by stage of the soybean cyst nematode. Bio. Control, 47:244-249.