Mycoscience 37: 81–89, 1996

Taxonomy and ecology of *Dactylella iridis*: Its redescription as an entomogenous and nematode-capturing hyphomycete

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Accepted for publication 25 December 1995

***Trinacrium iridis, Dactylella ramiformis*, and our own isolates obtained from a dead midge were proved to be a single species by means of morphological, ecological and DNA homology studies. The simple-pore septal ultrastructure and Q-10(2H) ubiquinone of this fungus revealed its ascomycetous affinity. Morphological and ecological characteristics of this species led it to be accomodated in the genus *Dactylella*. The fungus is redescribed here, because the combined name *D. iridis* had been defectively issued. We have corrected nomenclatural errors and described all characteristics of this species. *Dactylella iridis* produces three types of conidia; Y-shaped aquatic, cylindrical aerial or terrestrial, and elliptical secondary conidia. The production of the former two types of conidia is enhanced by wetting mycelia grown on a sterilized midge body on silkworm chrysalis extract agar plates. All the strains examined have a predatory behavior on nematodes. Thus, the fungus has versatile talents for aquatic, terrestrial, saprophytic, entomogenous and nematophagous lives.**

Key Words——*Dactylella iridis; Dactylella ramiformis*; entomogenous fungus; nematode predator; *Trinacrium iridis*.

During the survey of aquatic fungi in paddy fields in 1990, we obtained a fungus from rice straw incubated under water by isolating conidia floating close to a dead midge on the water surface. The conidia were of the Y-shaped *Trinacrium* Riess-type with a lateral filiform appendage. In culture, isolates of the fungus sporulated when they were incubated with a sterilized midge and dipped into water on the midge body. They produced cylindrical *Dactylella* Grove-type conidia and smaller elliptical *Dactylaria* Sacc.-type conidia, in addition to the Y-shaped conidia. Because we suspected this fungus to have affinity with either entomophthoralean or carnivorous *T. subtile* Riess-like fungi, we examined the nuclear numbers of hyphal cells and conidia, ubiquinone molecules, ultrastructure of hyphal septa and parasitism on oomycete mycelia, nematodes and living larvae of midge. Consequently, we found it to be a nematode predator (Nakagiri, 1991a).

In the meantime, a deuteromycete from *Iris* root from Japan was described as *Trinacrium iridis* T. Watanabe which had three-types of conidia (Watanabe, 1992), quite similar to those found in our isolates. Soon after the description, *Dactylella ramiformis* Liu & Qiu was described as a nematode-trapping hyphomycete from the soil of rhizospheres of *Triticum sativum* from China. This fungus also produces the three types of conidia (Liu and Qiu, 1993). Recently, Zhang et al.(1994) casually transferred *T. iridis* to the genus *Dactylella* without any taxonomic argument. Thus, we compared these two fungi with our isolates in morpholgy, ecology (especially, predatory behavior on nematodes and spore production on insects) and DNA relatedness to know the characteristics and taxonomic status of the three.

Materials and Methods

Isolates Rice straw was collected from a paddy field in Shimamoto-cho, Mishima-gun, Osaka, Japan on 16 Jan. 1990, and submerged in distilled water in a Petri dish. After one month's incubation at room temperature (15-25°C), Y-shaped spores (consequently proved to be conidia) with a lateral filiform appendage were found floating close to a dead midge (Chironomidae), from which the conidia were thought to have been released. The midge had probably emerged from a larva in the straw. The appendage rose perpendicularly from the main axis of the conidium at its basal portion (Fig. 1). Single conidium isolates (AN-1101,1102,1103,1104, 1105; AN-1101=IFO 32691) were obtained with a Skerman type micromanipulator and subcultured on cornmeal agar(CMA). The strains of *T. iridis* (82-567 (Watanabe)=IFO 32554) and *D. ramiformis* (89019-1 (Liu)=IFO 32587) were kindly supplied by Drs. Watanabe and Liu, respectively, and were used for comparative studies.

Media and induction of conidium formation The strains were subcultured on the following media; potato-sucrose agar(PSA), malt extract agar(MA), oatmeal agar(OA), potato-carrot agar(PCA), V-8 juice agar(V-8A), CMA, CEA (1% Chrysalis extract (Wako Pure Chem. Ind. Ltd.), 1.5% agar), peptone agar(PTA)(1% Polypepton (Wako Pure Chem. Ind. Ltd.), 1.5% agar) and nutrient broth agar (NBA)(1% Nutrient broth(Difco), 1.5% agar). To induce conidium formation, agar blocks with mycelia were cut

from the above medium plates and submerged into sterilized distilled water. The strains were also subcultured on CEA, CMA and V-8A plates on which autoclaved midges (*Chironomus* spp.) or other insects (locusts, winged ants and leafhoppers) were put. When the mycelia grew over the insects, the agar blocks with or without the insects were cut from the plates and transferred into sterilized distilled water. Small pieces of snake skin and flakes of chitin (Tokyo Kasei Kogyo Ltd.) were also used in place of the midges. Since CEA slightly induced conidium formation, the effect of re-extracts from the chrysalis extract was examined by incubating the strains on CMA together with paper discs (8 mm in diam) infiltrated with the re-extracts. The re-extraction was done on a Soxhlet's extractor with chloroform and ethyl ether. After the paper discs had become covered with the mycelia, they were transferred into distilled water.

Staining of nucleus Nuclei of hyphal cells and conidia of the strains AN-1101-AN-1105 were stained with Hoechst 33258 after 5 min fixation with the Carnoy's fluid (methanol: acetic acid = 2:1, v/v) and observed under Nikon fluorescence microscope XF-EFDA by UV exitation.

Electron microscopy To obtain scanninig electron micrographs of conidia, conidium ontogeny and traps of nematodes, materials were prepared by Cole and Samson's (1979) procedure. A scanning electron microscope (SEM)(JSM 5400, JEOL) was operated at 15 or 20 kV. Septal structure of mycelia was observed with a transmission electron microscope (TEM)(JEOL 1200 EX, JEOL). The strain AN-1101 was incubated in the liquid medium (0.1% chrysalis extract, 1% glucose) for 5 d at 28°C. The harvested mycelia were washed with phosphate buffer (pH 7.2) and fixed with 4% glutaraldehyde for 4 h at room temperature, followed by 1% osmium tetraoxide for 12 h at 4°C. The specimens dehydrated with ethanol series were embedded in Spurr's resine at a firm level. Ultra-thin sections were stained with lead acetate and uranyl acetate for TEM observation.

Inoculation test on midge larvae The strain AN-1101 was induced to sporulate preliminarily by submerging agar blocks of CEA with its mycelium subcultured with a sterilized midge. Then, living midge larvae (*Chironomus plumosus* L.) were added into the water and exposed to the conidia. The living midge larvae were incubated at 17°C and room temperature (20-25°C) for 3-4 wk.

Inoculation test on pythiaceous fungus To examine the infectivity of AN-1101 to *Pythium graminicola* Subramaniam (IFO 32330), both fungi were cultured together on CMA and plane agar (PA), and agar blocks of CMA with both mycelia were submerged together in water and incubated at room temperature for one mo.

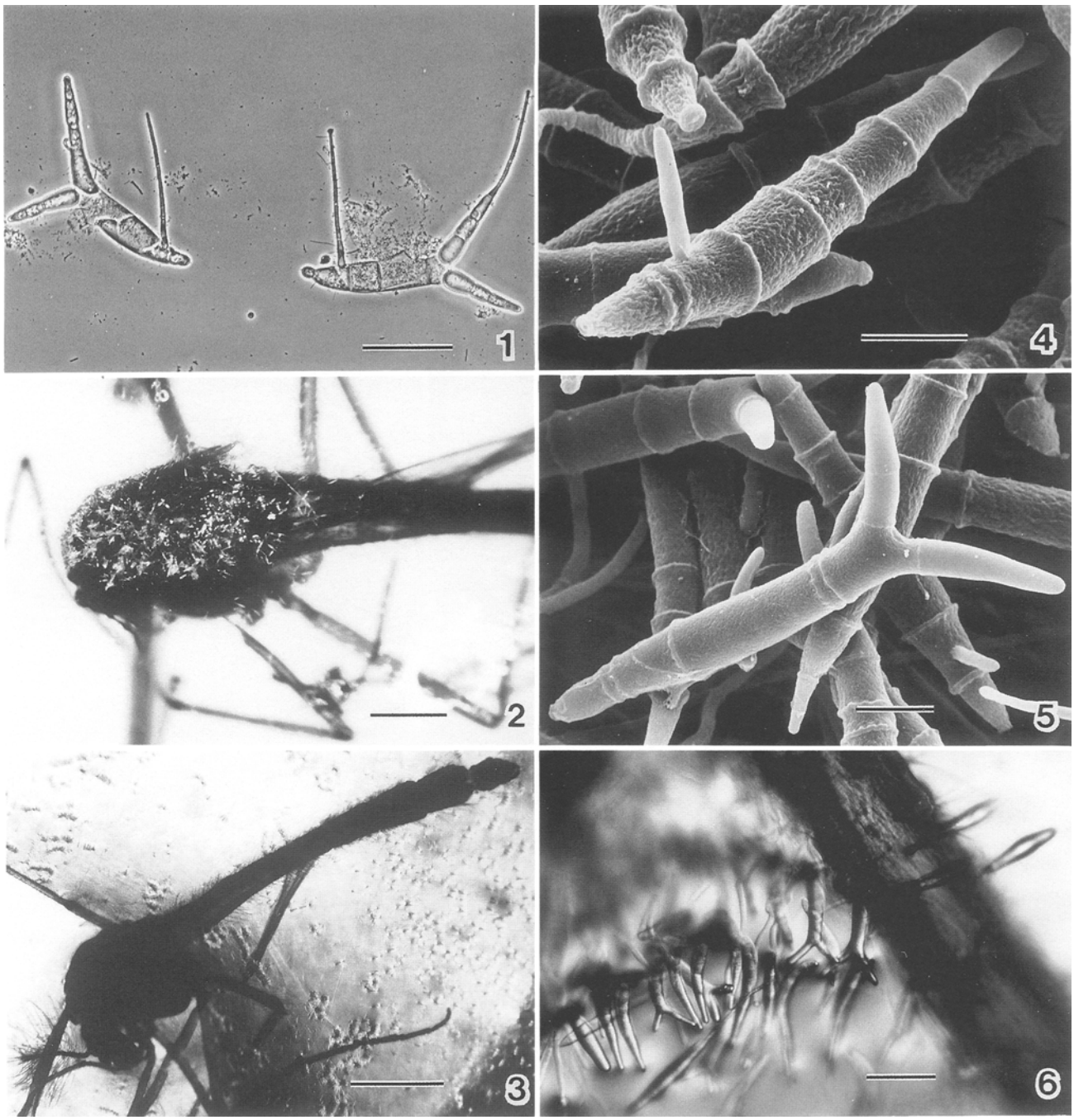
Predatory test on nematodes The strains of our fungus were subcultured on both CMA and PA. After incubation for 3 d, nematodes were added to the plates. The nematodes had been isolated by Baermann funnel method (Barron, 1977) from soil of a vegetable field and propagated on PSA supplemented with several drops of corn pottage (available as an instant soup powder). The fungus was then incubated with the nematodes on the media for one to two wk at room temperature and regularly examined for nematode-trap formation.

Ubiquinone analysis Three of our isolates, AN-1101, AN-1102 and AN-1103, were cultured in a liquid medium containing 1% glucose, 0.1% yeast extract and 0.1% peptone for two wk at 24°C, and the mycelia were harvested and lyophilized. Ubiquinones were extracted from the powdered mycelia (ca. 4 g (dry weight) with chloroform/methanol (2:1, v/v), and analyzed by HPLC with the following standard ubiquinones: Q-6,7,8,9,10, 10(2H) and 10(4H)(Nakagiri, 1991b).

G+C contents and homology analysis of DNA To clarify the species identity at a genetic level between strains AN-1101 and AN-1102, *T. iridis* (IFO 32554) and *D. ramiformis* (IFO 32587), G+C contents of their DNAs and DNA homology were analyzed. These strains were cultured in 400 ml of yeast extract and malt extract solution (YM solution: 1% glucose, 0.5% peptone, 0.3% yeast extract, 0.3% malt extract) at 28°C for 5 d. *Monacrosporium ellipsosporum* (Grove) Cooke & Dickinson (≡*Dactylella ellipsospora* Grove)(IFO 9337) was employed as a control for DNA homology tests. This strain was incubated in the same medium at 24°C for 2 wk. The mycelia were harvested by centrifugation and washed three times with saline water (0.87% NaCl), then twice with saline EDTA (0.15 M NaCl, 0.1 M EDTA, pH 8.0). Lyophilized mycelia were powdered with a mortar and pestle. For DNA extraction and purification, Zolan and Pukkila's (1986) protocol was employed. G+C contents of DNA were analyzed by HPLC (Tamaoka and Komagata, 1984; Mesbah et al., 1989). DNA-DNA hybridization and homology analysis were carried out by the method of Ezaki et al.(1988, 1989).

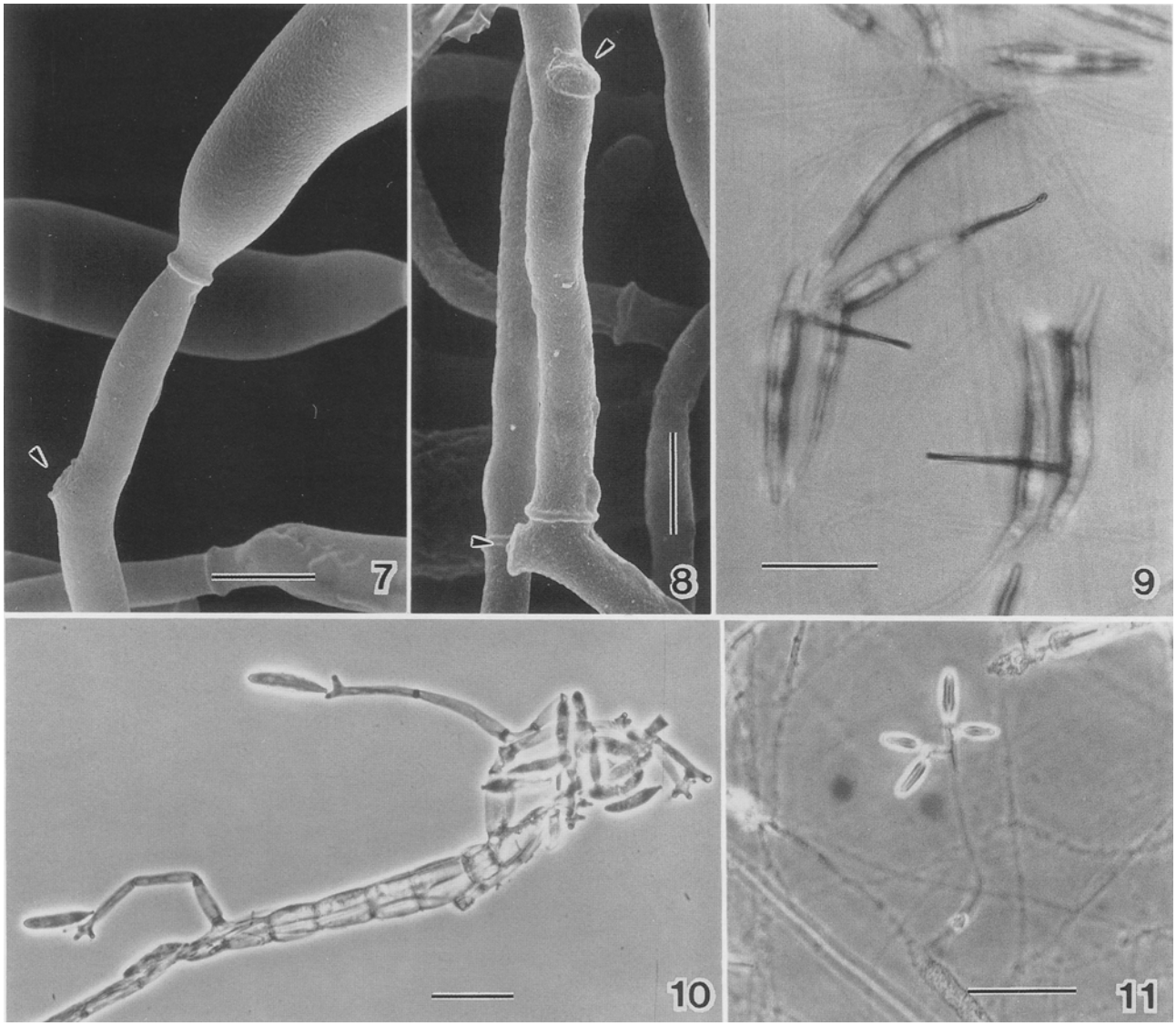
Results

Conidium formation All strains grew well on all the media used, but conidium formation was only induced in the case of the following treatments. When the strains were cultured on CEA or PCA plates, they produced a small number of conidia on erect conidiophores, most of which were cylindrical *Dactylella*-type conidia. However, conidium formation was remarkably enhanced by subculturing the strains on CEA with an autoclaved midge and then submerging a midge on agar blocks with mycelia into distilled water (Figs. 2, 3). When other insects (locusts, winged ants and leafhoppers) were used instead of a midge, conidium formation was not induced at all. Snake skin and chitin flakes also had no effect. Two types of conidia, cylindrical *Dactylella*-type (Fig. 4) and Y-shaped *Trinacrium*-type (Fig. 5), were produced 1-2 d after the submersion in water. The cylindrical conidia were produced mostly from aerial conidiophores arising from the midge body, but the Y-shaped conidia were formed at the water surface and the water's edge on the insect body (Fig. 6). Submerged conidiophores for the latter type conidia extend to the surface of the water and form conidia which float on the surface. These two types of conidia are considered to be aerial



Figs. 1–6. *Dactylella iridis*.
1–3, 6. Light micrographs. 4,5. Scanning electron micrographs. 1. Y-shaped conidia with a filiform appendage. 2. Conidia formed abundantly on a midge body dipped in water. 3. Released conidia, floating around the midge dipped in water. 4. Cylindrical conidia formed on a midge body. A filiform appendage is arising from the penultimate cell of a conidium. 5. Y-shaped conidia formed on a midge body. 6. Y-shaped conidia formed on the water surface close to a midge. Floating conidia anastomose to form a raft. Bars: 1,6=50 μm; 2=500 μm; 3=1 mm; 4, 5=10 μm.

and aquatic conidia, respectively. Both types are formed holoblastically on the sympodially or percurrently proliferating conidiophores (Figs. 7, 8). When the conidia are liberated from the conidiophores, they float on the water surface and anastomose together to make a raft of conidia. The floating conidia (both cylindrical and Y-shaped) raise a filiform hyphal appendage into the air from the penultimate cell of the conidium soon after the conidial liberation (Fig. 9). The filiform appendage, standing like a sail or a mast on a boat, may work for conidium dispersal or entrapment of a host insect. About one mo after the conidium formation on the sub-



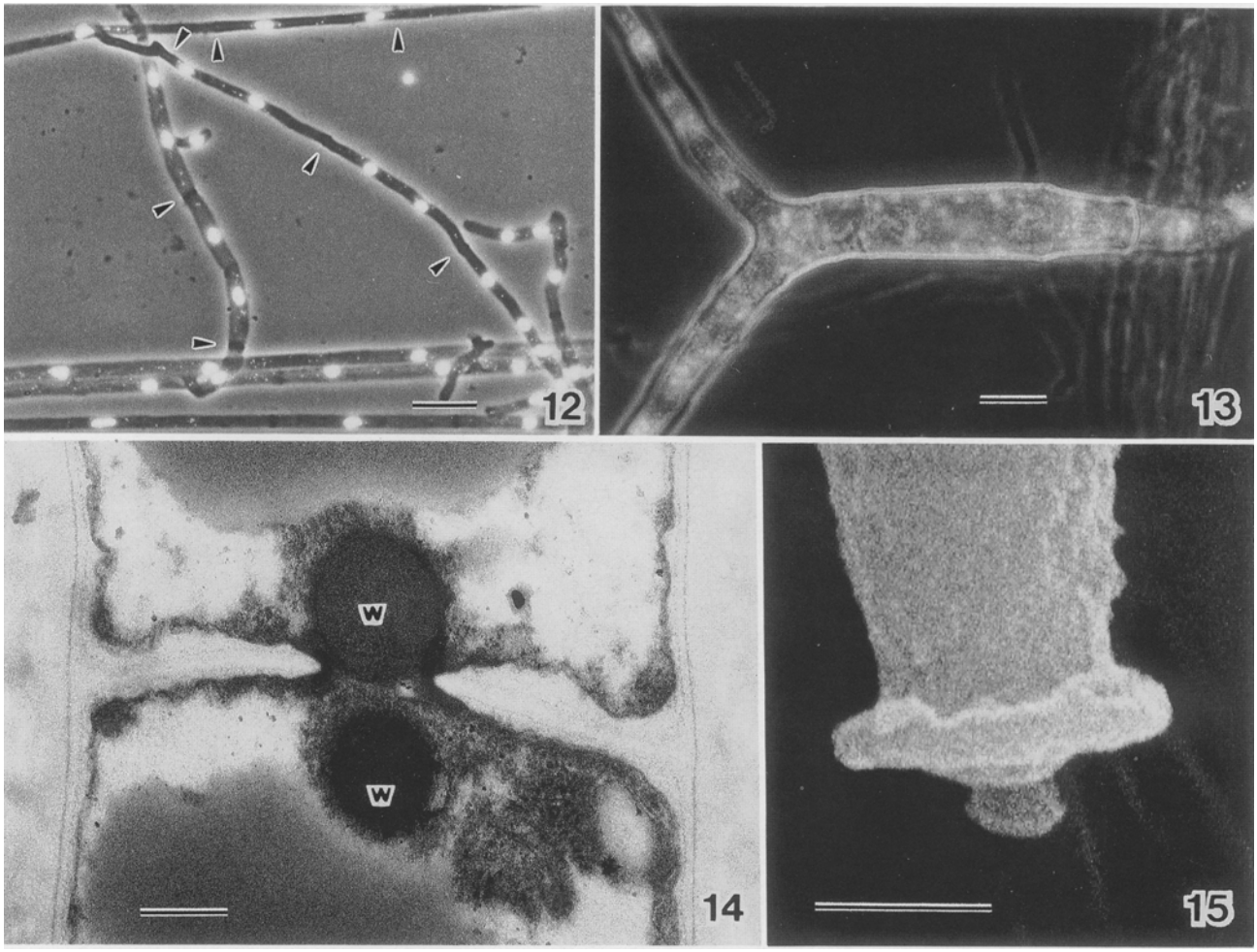
Figs. 7–11. *Dactylella iridis*.
7, 8. Scanning electron micrographs. 9–11. Light micrographs. 7, 8. Sympodially proliferating conidiophores with disc-shaped scars of conidium detachment (arrowheads). 9. Floating conidia on the water surface raising appendages into the air. 10. Elliptical conidia formed sympodially on conidiophores arising from a cylindrical large conidium. 11. Elliptical conidia formed on a conidiophore arising from repent hypha on the water surface. Bars: 7, 8=5 μm; 9, 11=50 μm; 10=20 μm.

merged midge body, the smaller elliptical *Dactylaria*-type conidia were formed sympodially on the aerial appendages or on short conidiophores arising from conidia (Fig. 10) and repent hyphae creeping on the water surface (Fig. 11). Conidia of the latter type were also produced on aerial conidiophores arising from the mycelia creeping on the water surface, when the mycelia on the paper discs with the re-extracted chrysalis extract were submerged in the water for three months. This indicates that the *Dactylaria*-type conidia are the secondary conidia which are formed only during starvation.

The three types of conidia were produced only after the above treatments. The enhanced conidium formation on the midge body by dipping it into water was also shown by *T. iridis* IFO 32554 and *D. ramiformis* IFO 32587. The three types of conidia produced by the two authentic strains and our isolate are similar in shape and size as shown in Table 1.

Nuclear numbers Fluorescence microscopy revealed two to three (rarely one or up to five) nuclei in each hyphal cell (Fig. 12), whereas the three types of conidia contain 3–14 nuclei per cell (Fig. 13).

Septal structure Simple septal structure associated with Woronin bodies was shown by the TEM observation (Fig. 14). Under the SEM, it was often observed that the central pore was occluded by a Woronin body-like spherical body at the detachment of the proximal cell of the conidium (Fig. 15).



Figs. 12–15. *Dactylella iridis*.
12, 13. Fluorescence micrographs. 14. Transmission electron micrograph. 15. Scanning electron micrograph. 12. (1-)2-3-nucleate cells of hyphae. Arrowheads indicate septa. 13. Y-shaped conidium composed of multi-nucleate cells. 14. Simple septal structure with Woronin bodies(W). 15. Woronin body-like spherical body occluding the central pore of the proximal cell of a conidium. Bars: 12, 13=10 μm; 14=200 nm; 15=1 μm.

Parasitism and predatory behavior on nematodes Although any parasitism of the strain AN-1101 was not observed in the mixed cultures with the living midge larvae and with the strain of *P. graminicola*, nematophagy was clearly exhibited by the nematode-feeding experiment. When our isolates were cultured on CMA with nematodes for one wk, they produced a number of traps on the agar plate and captured nematodes (Fig. 16). The trap is the three-dimensional network composed of adhesive loops of hyphae formed by anastomosis of hyphal branches and the repetitive loop-formation (Fig. 18). The trap captures a nematode by holding it firmly by the surface cuticle with the adhesive material (Fig. 19) and then invading the prey body with assimilative hyphae (Fig. 20). The nematode-predatory behavior was also observed in *T. iridis* IFO 32554 (Fig. 17) and *D. ramiformis* IFO 32587, though the latter fungus had been described as a nematode predator by Liu and Qiu (1993). Conidium formation was not induced when mycelia with trapped nematodes were immersed in water.

Ubiquinone type The single peak of Q-10(2H) was detected by HPLC analysis in the three strains examined.

DNA relatedness The average values of G+C contents of DNAs obtained from the dupulicate tests were shown in Table 2. The four strains (AN-1101, AN-1102, IFO 32554 and IFO 32587) have similar G+C mole % values, i. e., 43.0–43.4%. DNA-DNA homology values between these strains are also shown in Table 2, which indicates high homology values (higher than 75%) compared with those to *M. ellipsosporum* (13.1–19.4%).

Discussion

The above results from morphological, ecological and DNA studies revealed that our isolates (AN-1101–AN-1105), *T. iridis* (IFO 32554) and *D. ramiformis* (IFO 32587) are assignable to a single species. All of them showed characteristics identical to each other in forming three-types of conidia, remarkable induction of conidium formation by wetting mycelia that were grown on a

Table 1. Comparison of conidium size among our isolate (AN-1101), *Trinacrium iridis* (IFO 32554) and *Dactylella ramiformis* (IFO 32587).

Conidia	AN-1101 (IFO 32691)	IFO 32554 *T. iridis*	IFO 32587 *D. ramiformis*
Y-shaped conidia			
main axis			
length (μm)	66-104	50-90 (55-117.5)[a]	60-89
width (μm)	10-21	10-16 (13.7-17.5)	10-18
septa	2-8	4-5 (4-8)	4-7
arms			
length (μm)	20-98	28-70 (13.7-95)	16-43 (11-47)
width (μm)	5-12	4.5-9 (5-12.5)	6-8 (upto 3.6)
septa	1- 5	0-3 (1-5)	1-3 (1-4)
Cylindrical conidia			
length (μm)	80-198	60-120 (47.5-155)	72-122 (98-141)
width (μm)	9-20	9-17 (7.5-16.3)	8-16 (12.5-16.3)
septa	5-13	4-9	4-10 (5-12)
Elliptical conidia			
length (μm)	17-36	19-25 (20-47.5)	15-35 (14-29)
width (μm)	3-5	4-5 (3-5.3)	2.5-4 (3-5)
septa	0-2	0-2 (0-2)	0-1 (0)
Appendage			
length (μm)	86-148	66-140	50-72
width (μm)	2-4	2-3	1.5-2.5
septa	1-3	1-3	2

a) Data in parentheses from Watanabe (1992) and Liu and Qiu (1993).

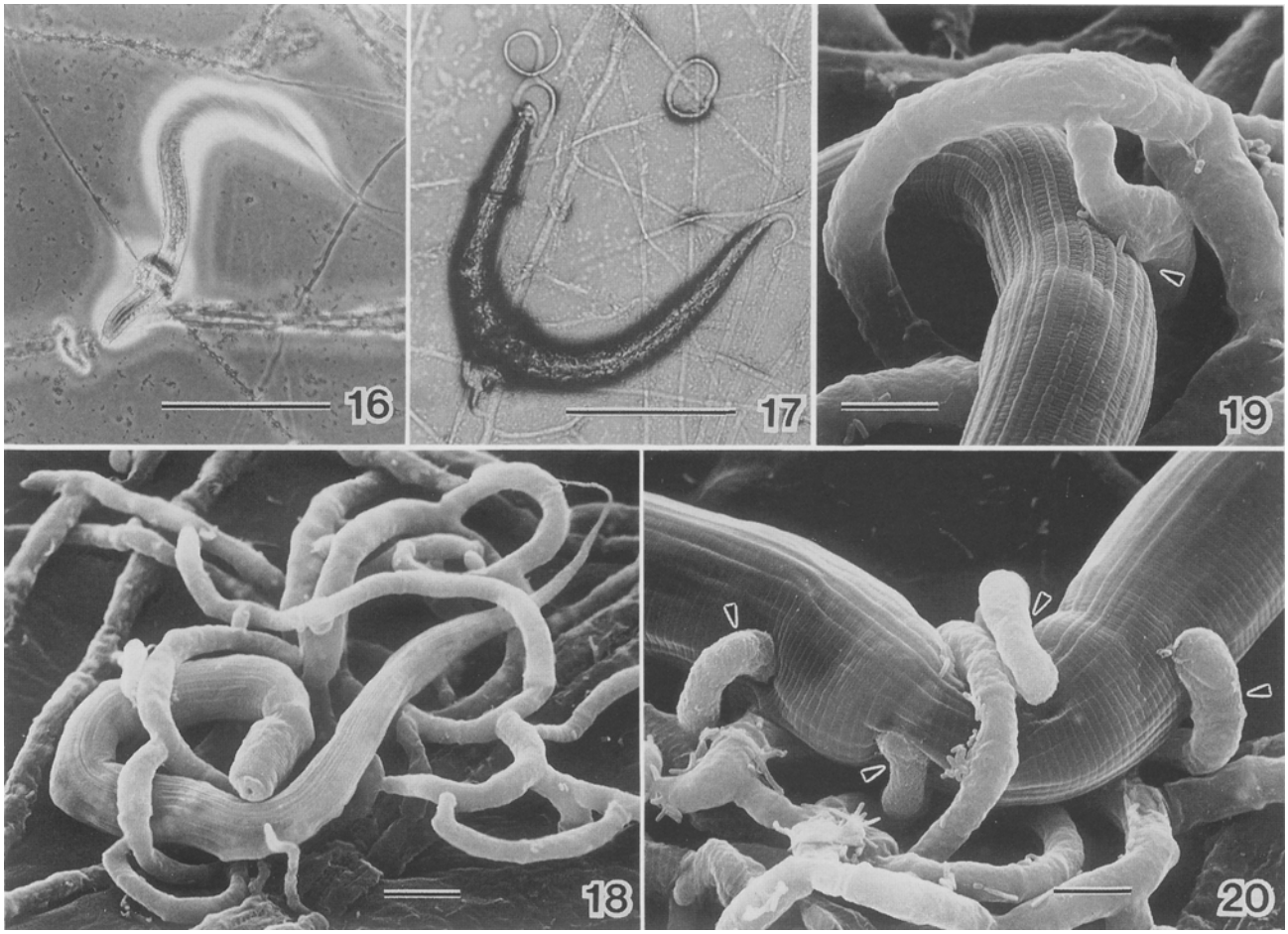
midge body, and having nematode-capturing behavior. Since the chrysalis extract and its re-extract by chloroform and ethyl ether showed some effects on conidium formation, this fungus may be entomogenous, depending on insects, especially midges, for the nutrition for reproduction.

Concerning the taxonomic position of this fungus, we firstly suspected its affinity with entomophthoralean fungi, especially *Entomophthora* Fres. or *Erynia* Nowakowski species. Although their aerial spores are ballistosporous, some of them are known as parasites on aquatic insects and produce aerial and aquatic types of spores according to the environment (Descals and Webster, 1984; Descals et al., 1981). Since the present study revealed that the nuclear numbers in cells were multiple (1-5 nuclei in hyphae and 3-14 in conidium)(Figs. 12, 13), as in zygomycetous fungi, we further examined the septal ultrastructure of hyphae. We ascertained that it is a simple-pore septum accompanied by Woronin bodies (Fig. 14). The septum of this fungus is similar to that of two rotifer-trapping zoopagalean fungi, *Lecophagus fasciculatus* Dick (Abro and Dick, 1990) and a strain of *Zoophagus insidians* Sommerstorff (Powell et al., 1990). Lately, however, both the strains of the rotifer-trapping fungi used by those authors were revealed to be a hyphomycete, *Cephaliophora muscicola* Barron et al. (Morikawa et al., 1993). Although the simple-pore septum has been observed in many ascomycetes, the fine septal structure of the present fungus closely resembles that of *Dactylella leptospora* Drechsler (Saikawa, 1985) and *D. lysipaga* Drechsler in that the septal pore is held between a pair of Woronin bodies and is lined by electron-opaque material (Wimble and Young, 1983)(Fig. 14).

Ubiquinone of this fungus was found to be of the hydrogenated type, Q-10(2H). Since this type of ubiquinone has been found in ascomycetes and deuteromy-

Table 2. G+C contents of DNA and levels of DNA similarity among our own isolates (AN-1101, AN-1102), *Trinacrium iridis* (IFO 32554), *Dactylella ramiformis* (IFO 32587) and *Monacrosporium ellipsosporum* (IFO 9337).

Strains	G+C (mol%)	% Similarity with labeled DNA from		
		AN-1101	IFO 32554	IFO 32587
AN-1101 (IFO 32691)	43.4	100	129.5	117.9
AN-1102	43.3	93.0	117.3	98.8
T. iridis (IFO 32554)	43.1	75.6	100	77.4
D. ramiformis (IFO 32587)	43.0	83.4	106.8	100
M. ellipsosporum (IFO 9337)	44.2	13.1	19.4	13.3



Figs. 16–20. *Dactylella iridis*.
16, 17. Light micrographs. 18–20. Scanning electron micrographs. 16. The strain AN-1101(IFO 32691) capturing a nematode which is struggling to escape from the trap. 17. IFO 32554(*Trinacrium iridis*) capturing a nematode. 18. Three-dimensional adhesive net and a captured nematode. 19. Trap hypha holding a nematode firmly by adhering (at the arrowhead) to the surface cuticle of the prey. 20. Assimilative hyphae (arrowheads) invading a captured nematode body. Bars: 16, 17=100 μm; 18=10 μm; 19, 20=5 μm.

cetes with ascomycetous affinity but not in other fungal groups (Kuraishi et al., 1985; Shiba, 1987; Sugiyama et al., 1988), it is apparent that this fungus has an affinity with ascomycetes.

From the morphological, ultrastructural and chemical evidence, it is concluded that the present fungus is a deuteromycete with ascomycetous affinity. The presence of multiple nuclei in hyphal and conidial cells is not inconsistent with this conclusion, because other deuteromycetes, e.g., *Fusarium* Link and *Aspergillus* Micheli ex Link species also have been reported to have multinucleate cells (2–20 nuclei per cell)(El-Ani, 1990).

This fungus was originally described as *Trinacrium iridis* (Watanabe, 1992), as a unique species forming secondary microconidia. Among the *Trinacrium* species, *Trinacrium subtile* Riess, the type species of the genus, resembles *T. iridis* in producing several types of conidia, cylindrical (no arm), Y-shaped (2 arms) and cruciform (3(-5) arms) conidia, but differ in not having *Dactylaria*-like secondary conidia and also in parasitizing fungi (*Stilbospora* Pers. and *Pythium* Pringsh.) and insect eggs (Drechsler, 1938) but not nematodes. Five known species of *Trinacrium* other than *T. iridis* form short conidiophores which proliferate sympodially with short intervals, resulting in a denticulate appearance after liberation of conidia (Drechsler, 1938; Matsushima, 1975, 1987; Tzean and Chen, 1989). In addition, nematode-predatory behavior and *Dactylaria*-type secondary conidia formation have not yet been reported in *Trinacrium* species. From these morphological and biological characteristics, we concluded that it is not appropriate to accomodate *T. iridis* in the genus *Trinacrium*.

The present fungus has Y-shaped, cylindrical and elliptical conidia, all of which are produced holoblastically on sympodially proliferating conidiophores. The conidiophores producing Y-shaped or cylindrical conidia proliferate successively with long intervals and leave detachment scars of conidia on the side wall of the phore (Figs. 7, 8). Similar proliferation of conidiophores is seen in *Dactylella* species, especially in *D. spermatopha-*

ga Drechsler (Drechsler, 1938). *Dactylaria*-type secondary conidium formation has been reported in *Dactylella multiformis* Dowsett et al.(Dowsett et al., 1984), *Dactylella leptospora* (Drechsler, 1937) and *Dactylella gampsospora* (Drechsler) de Hoog & van Oorschot (Drechsler, 1961). The anastomosis between detached conidia observed in the present fungus has been also reported in *Dactylella multiformis* (Dowsett et al., 1984), *Dactylaria polycephala* Drechsler (≡*Arthrobotrys polycephala* (Drechsler) Rifai), *Dactylella spermatophaga* and *Dactylella gampsospora* (Drechsler, 1937,1938,1961).

The unsettled and confused situation of generic limitation of nematode-capturing hyphomycetes has been pointed out by Dowsette et al. (1984) and Liu and Qiu (1993). Oorschot (1985) proposed genera delimiting characters of *Arthrobotrys* Corda and allied genera, but no genus defined with his concept accommodates *T. iridis* properly. Thus, reevaluation of genera-delimiting characters is still required for this group of hyphomycetes. Although *T. iridis* has unique characteristics, we recognized that *Dactylella* is the most adequate genus to accommodate this species rather than establishing a new genus for it, because its characteristics in conidium morphology, conidium ontogeny, conidiophore proliferation, secondary conidium formation and conidial anastomosis are found commonly in the previously described *Dactylella* species. These characteristics also fit the generic description of *Dactylella* given by Barron (1968). The fusiform conidium morphology without an enlarged and elongated central cell does not place this species in *Monacrosporium* Oudem. according to the Subramanian's (1963) concept. According to the key to genera of the *Dactylaria* complex proposed by de Hoog and Oorschot (1985), this fungus would fall into the genus *Dactylella*, if its conidiogenesis could be considered "thallic" (otherwise, it would not be placed in any genus).

The combined name *Dactylella iridis* was issued by Zhang et al. (1994), but they incorrectly described the species epithet and the author's name, as *Dactylella irida* (Watanabe) Ke Q. Zhang, Liu & Cao, and they did not give any reasons or argument for their taxonomic treatment. In addition, they treated *D. ramiformis* as a separate species. Therefore, we redescribe here the correct name of this taxon with its synonyms. All characteristics of this fungus revealed in this study are also described.

Dactylella iridis (T. Watanabe) Ke Q. Zhang, Liu & Cao, Mycosystema **7**: 112. 1994. Figs. 1-20

Basionym: *Trinacrium iridis* T. Watanabe, Mycologia **84**: 794. 1992

=*Dactylella ramiformis* Liu & Qiu, Mycol. Res. **97**: 359. 1993.

Colonies white, attaining 36-37 mm diameter on CMA or 27-29 mm diameter on MA after 4 d incubation at 25°C, with sparse aerial hyphae. Hyphae hyaline, septate, branched, 1.5-8 μm wide. Conidiophores for Y-shaped and cylindrical conidia hyaline, septate, simple, forming conidia apically, proliferating sympodially or percurrently, (10-)62.5-170 × 2-6 μm. Conidiophores for elliptical secondary conidia hyaline, septate, branched, proliferating sympodially, bearing conidia on short denticles, 28-88 × 3-6 μm. Conidia: 1) Y-shaped conidia composed of a main axis 50-104 × 10-21 μm, 2-8-septate, and 2 to rarely 3 arms 11-98 × 4.5-12 μm, 0-5-septate, hyaline; 2) cylindrical conidia fusiform, 60-198 × 7.5-20 μm, 4-13-septate, hyaline; 3) elliptical secondary conidia 14-47.5 × 2.5-5.3 μm, 0-2-septate, hyaline. The former two types of conidia bear a filiform appendage 50-148 × 2-4 μm, 1-3-septate, arising erectly from the penultimate cell of conidia. Nematode-traps composed of loops of hyphae 2-6 μm wide, branching, anastomosing, forming three-dimensional nets; loops 24-34 μm in diam, composed of 4-6-septate hypha. Adhesive material exudes at the loop hyphae. Chlamydospore-like swollen cells, formed on repent hyphae and frequently on submerged hyphae in water, hyaline, globose to elongate, 8-16 μm in diam, 3-11 cells catenate, branched, terminal or intercalary.

Conidium formation of this fungus is enhanced by wetting mycelia grown on a midge body. Conidia are hydrophobic and float on the water surface, then extend an appendage.

Dactylella iridis was found as a unique, multi-talented fungus equipped with various behaviors: aquatic, terrestrial, saprophytic, nematode-predatory and possibly entomogenous. It seems reasonable to assume that this fungus changes its life-style in response to the habitats and nutritional conditions in nature.

Acknowledgements——We wish to thank Dr. T. Watanabe (Forestry and Forest Products Research Institute, Japan) and Dr. X. Z. Liu (Biological Control Lab., People's Republic of China) for providing us their cultures. We also thank Mr. K. Mikata (IFO) for his instruction and much help for DNA analysis, Dr. K. Imai (IFO) for his advice on the preparation of chloroform and ethyl ether extracts of chrysalis extract, and Mr. K. Hikawa and Dr. A. Shino (Takeda Chemical Ind. Ltd.) for their help in TEM observation.

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