

## *Condylospora vietnamensis*, a new Ingoldian hyphomycete isolated from fallen leaves in Vietnam

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**Abstract** A new Ingoldian hyphomycete was isolated from fallen leaves in Bach Ma National Park, Vietnam, and is described here as *Condylospora vietnamensis*. This fungus is different from four known *Condylospora* species in morphological characteristics, having U- or N-shaped conidia.

**Keywords** Anamorphic fungi · Taxonomy

The genus *Condylospora* was established by Nawawi (1976) based on *C. spumigena* Nawawi, isolated from a foam sample collected in Malaysia. The hyaline and multiseptate conidia are unique in morphology; they are wormlike and have a characteristic elbow-shaped bend near the middle. Similar spores had been earlier reported as unidentified fungi from Papua New Guinea (Tubaki 1965), India (Ingold and Webster 1973), and Japan (Matsushima 1975). *Condylospora spumigena* has also been found in India (Chandrashekar et al. 1990), Puerto Rico (Santos-Flores et al. 1996), Thailand (Phongpaichit et al. 2002), Poland (Czeczuga et al. 2003), South America (Schoenlein-Crusius and Piccolo 2003), and Venezuela (Cressa and Smits 2007).

In 1985, two other *Condylospora* species were found in the stream spora in Malaysia (Nawawi 1985). Later, Nawawi and Kuthubutheen (1988) described these fungi on

submerged decaying twigs in Malaysia as the second and the third species: *C. gigantea* Nawawi & Kuthub. and *C. flexuosa* Nawawi & Kuthub. *Condylospora gigantea* was recorded also from Puerto Rico (Santos-Flores et al. 1996) and Poland (Czeczuga et al. 2003); and *C. flexuosa* in Puerto Rico (Santos-Flores et al. 1996) and Venezuela (Smits et al. 2007).

A candidate for the fourth species producing mostly N-shaped conidia was also found in Malaysia (Nawawi 1985; Nawawi and Kuthubutheen 1988), but it has not yet been described formally; that is, it has not been previously reported as a valid description.

During an investigation of microfungi in Vietnam, an undescribed *Condylospora*-like fungus producing short and small N-shaped conidia was found from the fallen leaves. The purpose of this study is to describe this fungus as a new species of *Condylospora*.

Fallen leaves were collected at Bach Ma National Park in the central part of Vietnam in April 2005 by K. Ando. The sample was kept in a moist chamber for 2–3 days in a laboratory, then immersed into water in a 500-ml beaker and stirred gently. A small amount of surface water was collected using a glass slide (Bandoni and Koske 1974) and spread on a low nutrient carbon agar medium (LCA; Miura and Kudo 1970). After confirming the spores on the medium under a light microscope, single-spore cultures were isolated by a Skerman's micromanipulator to obtain the pure culture.

These isolates were cultured at 25°C on LCA, cornmeal agar (CMA; Nissui, Tokyo, Japan), and 2% malt agar (MA; Becton–Dickinson, Sparks, MD, USA) for morphological observation. Observation was made under a differential interference contrast microscope (DIC; Axioplan 2, Zeiss, Jena, Germany) and a scanning electron microscope (SEM; JSM-6060, JEOL, Tokyo, Japan). For SEM, a small piece (2 × 2 mm) of the colony was cut and fixed with 1% OsO<sub>4</sub>

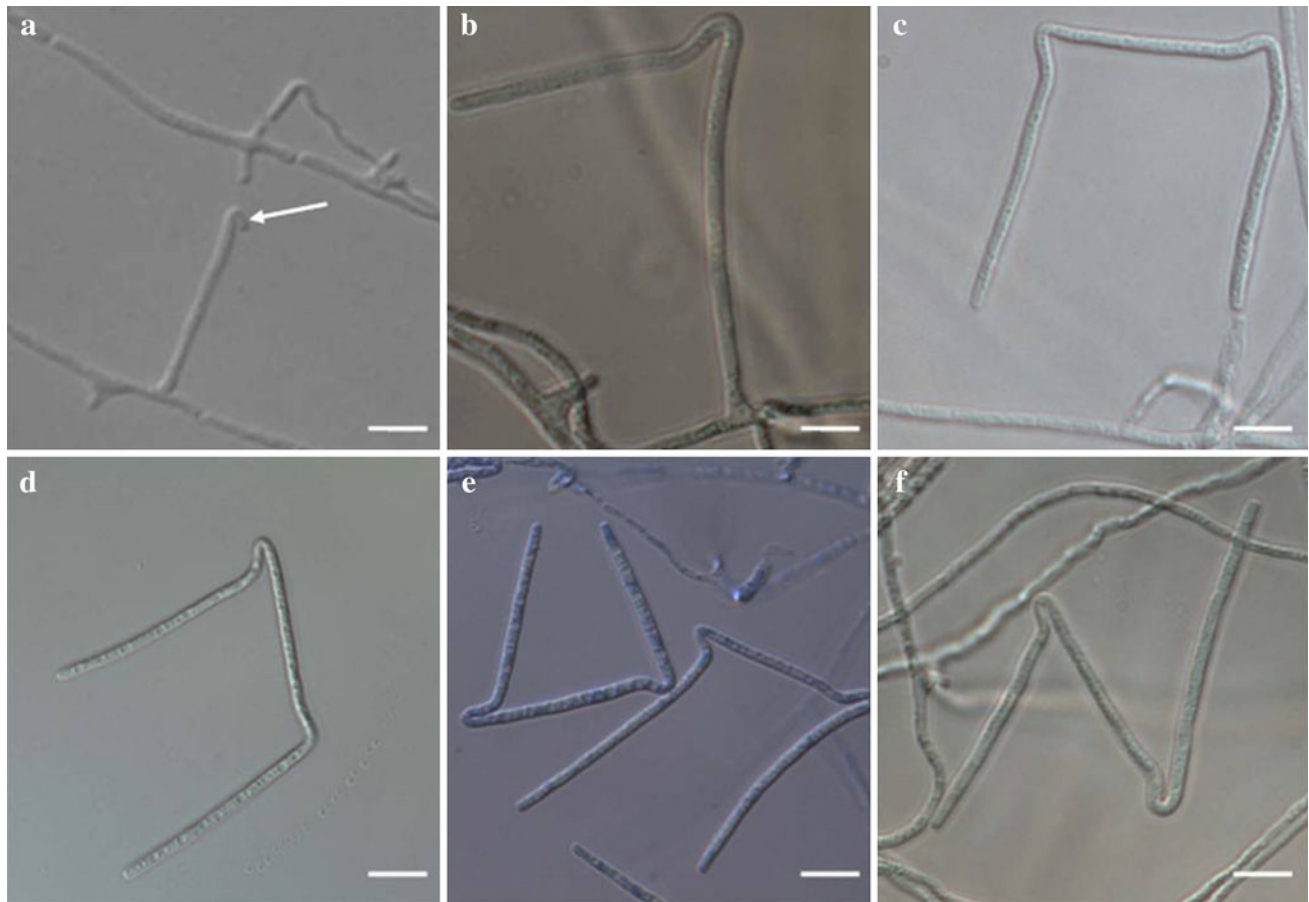
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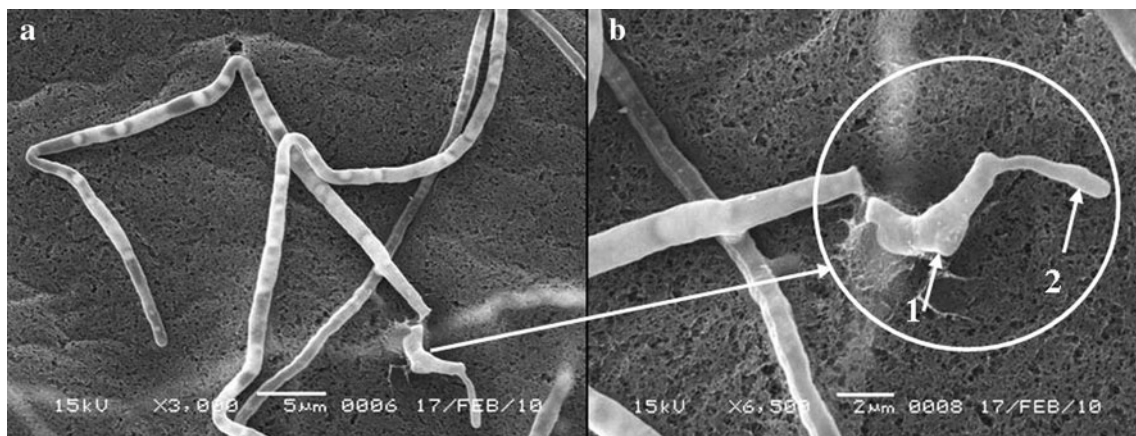
aqueous solution (aq. sol.) at room temperature for 2 h, then dehydrated in an ethanol series and finally substituted with isoamyl acetate. After critical point drying (HCP-2; Hitachi, Tokyo, Japan) and coating with platinum–palladium

(JUC-5000; JEOL, Tokyo, Japan) the specimens were observed under SEM at 15 kV.

*Condylospora vietnamensis* L.T.H. Yen & K. Ando, sp. nov. Figs. 1, 2, 3

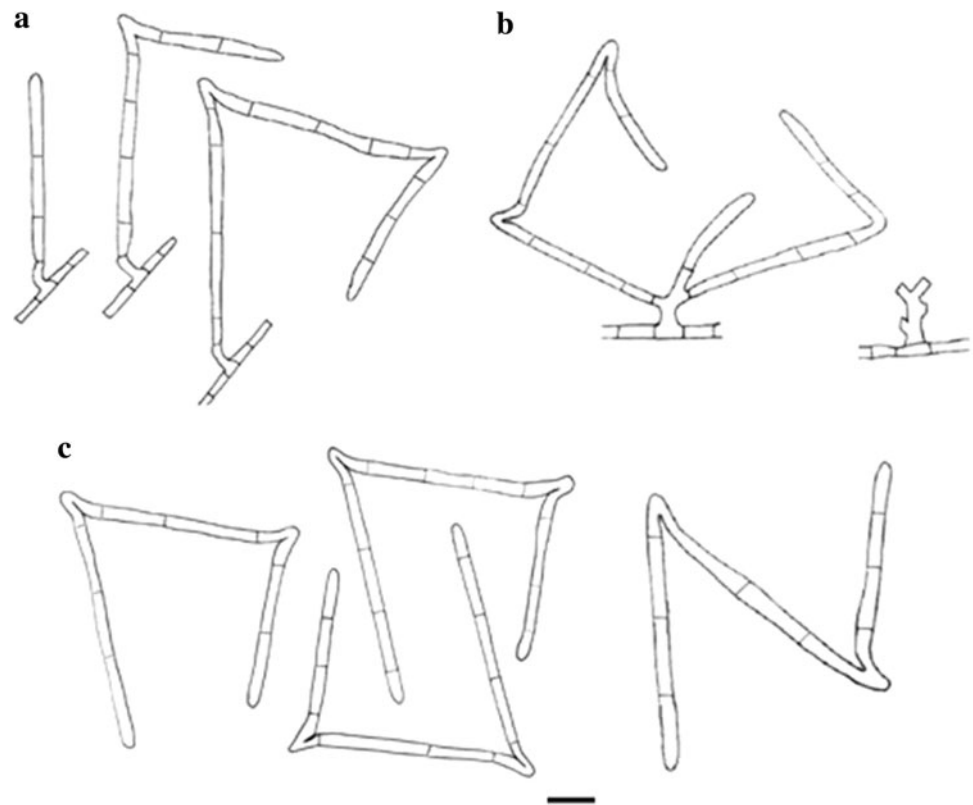


**Fig. 1** *Condylospora vietnamensis* VTCCF-1208 on low nutrient carbon agar (LCA). **a–c** Conidial development: arrow in **a** shows the first curving point of the conidial initial. **d, e** U-shaped mature conidia. **f** N-shaped mature conidium. Bars 5 µm



**Fig. 2** *Condylospora vietnamensis* VTCCF-1208 on LCA. **a** U-shaped mature conidium. **b** Sympodially proliferating conidiogenous cell (arrow 1) and a new conidium initial (arrow 2). Bars **a** 5 µm; **b** 2 µm

**Fig. 3** *Condylospora vietnamensis* VTCCF-1208 on LCA. **a** Conidial development on short conidiogenous cells integrated in the hyphae. **b** Sympodial development in a conidiogenous cell (left) and the detachment rachi (right). **c** U-shaped (left) and N-shaped (right) conidia. Bar 5  $\mu$ m



**Table 1** Comparison of conidium morphology in the *Condylospora* species

Species	Conidia				References
	Number of incurved bends	Shape	Number of septa	Length ( $\mu$ m) <sup>a</sup>	
<i>C. spumigena</i>	1	L-shaped	10–15	72–102	Nawawi (1976)
<i>C. flexuosa</i>	3	S-shaped with straight tip	12–16	87–106	Nawawi and Kuthubutheen (1988)
<i>C. gigantea</i>	1	L-shaped	25–36	131–200	Nawawi and Kuthubutheen (1988)
<i>C. vietnamensis</i>	2	U-shaped or N-shaped	(3–) 8–9 (–12)	38–99	This study
<i>Condylospora</i> sp.	2	N-shaped or U-shaped <sup>b</sup>	27–42	150–180	Nawawi and Kuthubutheen (1988)

<sup>a</sup> Total length of the proximal, middle, and distal portions in conidia

<sup>b</sup> N-shaped and U-shaped conidia are shown in fig. 5 of Nawawi and Kuthubutheen (1988)

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Colonies on MA and LCA growing slowly, somewhat white to light cream, attaining 22–24 mm in diameter in 4 weeks at 25°C. Mycelium consisting of hyphae branched, septate, thin-walled, hyaline, and 1–1.5  $\mu$ m wide. Conidiogenous cells integrated, intercalary in hyphae, undifferentiated, short, simple, cylindrical (Figs. 1c, 3a), thin-walled; sometimes elongate, flexuous, sympodially proliferating (Figs. 2b, 3b), 3–20  $\times$  1.5–2  $\mu$ m, provided with up to five cylindrical denticles, 3–20  $\times$  1.5–2  $\mu$ m. Conidia holoblastic, hyaline, thin-walled, (3–)8–9(–12)-septate, incurved two times, typically U-shaped (Figs. 1c–e, 2a, 3c), sometimes

N-shaped (Figs. 1f, 3c), consisting of the proximal, middle, and distal portions that lie usually in a single plane; proximal portion straight, 15–35  $\times$  1–1.5  $\mu$ m; middle portion forming an angle of 60°–90° with the proximal part, 14–32  $\times$  1–1.5  $\mu$ m; distal portion lying parallel with the proximal part, 9–32.5  $\times$  1–1.5  $\mu$ m.

Teleomorph: Unknown.

Type: VTCCF H-1008 (holotype: dried culture specimen, from VTCCF-1208, on LCA) deposited in the Vietnam Type Culture Collection, Hanoi (VTCC). NBRC H-12773 (isotype: dried culture specimen, from VTCCF-1208, on

LCA) deposited in the NITE Biological Resource Center (NBRC).

Ex-type culture: VTCCF-1208 (=NBRC 107639), isolated from fallen leaves of unidentified deciduous broad-leaved tree, Bach Ma National Park, Hue Prov., Vietnam, 27 April 2005, collected by K. Ando.

According to the previous reports, the colonies in all the species of *Condylospora* grow rather slowly on MA and CMA, and they are dewy, white, or hyaline in color. No sporulation was observed in most of the species even when strips of agar culture were submerged in water and aerated, although these *Ingoldia* fungi were reported from submerged substrates (Nawawi and Kuthubutheen 1988). The new species, *C. vietnamensis*, readily produced conidia on LCA and MA without being submerged in water.

*Condylospora vietnamensis* agrees well with the type species in ontogeny, but it differs from other species of the genus in the shape and size of the conidia (Table 1). *Condylospora spumigena* and *C. gigantea* have L-shaped conidia with one incurved bend about the middle (Nawawi 1976; Nawawi and Kuthubutheen 1988), and *C. flexuosa* has S-shaped conidia with three bends around the middle (Nawawi and Kuthubutheen 1988) that lie in one or more plane. *Condylospora vietnamensis* has U-shaped or N-shaped conidia with two bends. The undescribed *Condylospora* species from Malaysia has similar N-shaped or U-shaped conidia (Nawawi 1985; Nawawi and Kuthubutheen 1988; cf. footnote in Table 1), but these are larger than those in *C. vietnamensis*.

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