Cylindrocladium Root and Petiole Rot of *Spathiphyllum* spp. New to Taiwan

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Key words : *Cylindrocladium spathiphylli*, root and petiole rot, *Spathiphyllum* spp.

Spathiphyllum spp., sometimes called peace lilies, are tropical perennial plants belonging to the family Araceae, which are grown for cut flowers and mass plantings in homes and office buildings^{1,2)}. *Cylindrocladium* root and petiole rots^{2,6)} were observed on *Spathiphyllum* sp. cv. 'Sensation' and an unknown cultivar of *Spathiphyllum* sp. at Yenpu, Pintung in July 1997. Symptoms, including dark brown to black necrotic lesions with a bright yellow halo, appeared on leaves (Plate I-A) on the lower part of petioles (Plate I-B), along with a severe root rot (Plate I-C). Halochlorosis and petiole epinasty of leaves with necrotic lesion(s) in the basal part of petioles (Plate I-D) were also observed on an unknown cultivar of *Spathiphyllum*.

Isolates were obtained from the interface between healthy and diseased tissues of both *Spathiphyllum* sp. cv. 'Sensation' and the unknown cultivar. These leaf, petiole and root sections were dipped into 2% sodium dichlorite for 3 to 5 min, plated onto 2% water agar (WA) and observed daily. *Cylindrocladium spathiphylli* Schoutties, El-Gholl and Alfieri was consistently isolated from these sections. Conidia were picked by a glass needle and spread on fresh WA plates. A single conidium was transferred to potato dextrose agar (PDA) or 10% V-8 agar. Colonies on PDA and V-8 were initially white and cottony, then turned brown to reddish brown.

Inoculum was prepared by cutting mycelial discs (5 mm in diameter) from V-8 plates. The discs were put onto artificial wounds and intact surfaces of leaves of *Spathiphyllum* sp. cv. 'Sensation' and the unknown cultivar, respectively. Blank V-8 agar discs were used as controls. The previously described symptoms appeared 2 days later on wounded and 4 days later on unwounded sites, but no symptoms appeared in control treatments. The fungus was reisolated from diseased tissues of inoculated leaves.

Morphological observations of *C. spathiphylli* were made on 4-day-old cultures grown at 25°C on Sach's medium⁴⁾ containing a piece of host leaf. Conidia and conidiophores were mounted in a lactophenol mixture. Scanning electron microscopy was also carried out on *C. spathiphylli* cultured on PDA. The samples were fixed with osmium tetroxide vapor at room temperature for

24 hr, then dehydrated with an ethanol series. After critical point dehydration, they were coated with a thin film of gold under high vacuum. A single stipe (sterile appendage) arose from a procumbent mycelial cell and terminated in a capitate, spatulate or ellipsoidal vesicle (Plate II-A). Conidiophores were borne laterally on the stipe and were hyaline, smooth and dichotomously branched. They terminated in two to four cylindrical nonseptate phialides (Plate II-B). The dominant vesicle shape for all *C. spathiphylli* isolates in this study was capitate (Plate II-C). Spatulate and ellipsoidal vesicles were also commonly seen, and rare bicellular vesicles were also observed (Plate II-D, E, F). The diameters of capitate vesicles were about 12.5-15.5 µm. Conidia were hyaline, cylindrical, 1-3 septate, 50.0-95.5×5.0-6.5 µm (ave. 80.5×6.0 µm) (Plate II-G). They were formed singly from the apex of the phialides and grouped in palisade-like clusters (Plate II-A). Most of the conidia were uni-septate (94.6%) with the occurrence of bi-septate conidia (5%) and tri-septate conidia (0.4%). Teleomorphic structures and sclerotial were not observed in diseased tissues and culture plates.

Pathogenicity tests were carried out by separately spraying spore suspensions (1.2×10^5 spores/ml) or placing mycelial discs (5 mm in diameter) onto leaves of some araceous plants, including *Alocasia* × *amazonica* hort., *Anthurium andraeanum* Linden, *Anubis barkeri*, *Dieffenbachia picta* (Lodd.) Schott 'Rudolph Roehrs', *Homalomena rubescens* (Roxb.) Kunth 'Emerald Gem', *Monstera deliciosa* Liebm. *Philodendron scandens* Koch and Sello subsp. *scandens*, *Rhaphidophora aurens* (Lind. ex Andre) Birdsey, *Spathiphyllum* sp., *Spathiphyllum* sp. cv. 'Sensation' and *Syngonium* cv. 'White Butterfly'. Although only *Spathiphyllum* spp. has been found to be susceptible to *C. spathiphylli*²⁾, *Monstera deliciosa* and *Philodendron scandens* subsp. *scandens* also showed symptoms 4 days after inoculation with mycelial discs or spore suspensions in this study. *Monstera deliciosa* showed symptoms similar to that of *Spathiphyllum* spp., whereas *Philodendron scandens* subsp. *scandens* showed water-soaked lesions.

Mycelial growth was tested by placing mycelia on a PDA disc (5 mm in diameter) onto PDA plates and the

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Fig. 1. Effects of temperature on mycelial growth (7 days, A) and germination (6 hr, B) of *Cyindrocladium spathiphylli* on PDA and WA, respectively.

plates were incubated in incubators at temperatures from 8 to 36°C. The colonies extended to 90 mm in diameter in about 7 days at 24°C. The optimal temperature for mycelial growth was 20–24°C (Fig. 1). Conidial germination was tested by spraying spore suspensions on WA plates, then incubating the plates in 8–36°C incubators for 6 hr. The conidia germinated at 16–36°C. The optimal temperature for spore germination was 24°C (Fig. 1).

Cyindrocladium root and petiole rot of *Spathiphyllum* spp. was first described in 1980 by Schoutties and El-Gholl⁷⁾ and subsequently discovered in many other areas and countries^{1,3,5,9)}. The causal agent was originally identified as *C. floridanum* Sobers and Seymour, then altered to *C. spathiphylli* in 1982, based on size of conidia, mode of stipe formation and shape of vesicles⁹⁾. In the original description of *C. spathiphylli*, the conidia were $80.3 \times 6.0 \mu\text{m}$ in size and presumably all uniseptate, and all vesicles were presumably capitate. However, isolates of *C. spathiphylli* from Hawaii and Florida in the United States presented different numbers of septa and shapes of vesicles⁹⁾. In those isolates, uni- to 3-septate conidia and various vesicle shapes were observed. Both

conidial and vesicle morphology in this domestic isolate of *C. spathiphylli* are in conformity with the isolates obtained by Uchida and Aragaki⁹⁾ and in accordance with the key proposed by Peerally⁶⁾. This is the first report of *Cyindrocladium* root and petiole rot of *Spathiphyllum* spp. in Taiwan.

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和文摘要

陳煌焜・郭章信・陳隆鐘：台湾において初発生のスパシフィルム (*Spathiphyllum* spp.) 根腐葉斑病

1997年7月、台湾屏東県塩埔町で種名・品種名不詳のスパシフィルム (*Spathiphyllum* spp.) および品種緑巨人 (*Spathiphyllum* sp. cv. 'Sensation') に根腐葉斑病 (root and petiole rot) が発生した。主な病徴は根腐、葉の褐色壊死病斑、全葉黄化および葉柄下垂で、罹病組織から *Cyindrocladium spathiphylli* Schoutties, El-Gholl and Alfieri が分離された。分離菌の菌糸は無色、菌柄は菌糸から単生し、菌柄先端の頂のうの多くは頭状でスプーン状ないし楕円形のものもあった。分生子柄は無色、二叉に分枝し、分枝先端部に2–4個のフィアライドが形成された。分生子は連続的にフィアライドから生じて棚状の束となり、無色、円筒形、1–3隔壁のものが多く、大きさは平均 $80.5 \times 6.0 \mu\text{m}$ であった。菌糸体は培地上で生育旺盛、初め白色、徐々に菌叢中央から赤褐色に変わった。菌糸生長および分生子発芽の最適温度は24°Cであった。台湾における本病の発生の報告はこれが最初である。

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Plate I

Plate I Symptoms of *Cylindrocladium* root and petiole rot of *Spathiphyllum* spp. Naturally infected plants of *Spathiphyllum* sp. cv. 'Sensation' shows necrotic lesions with yellow halo on leaves (A) and lower part of petiole (B) and severe root rot (C). An infected plant of *Spathiphyllum* sp. shows chlorotic leaves and epinastic petioles with necrotic lesion(s) in the basal part of petioles (D).

Plate II

Plate II Microscopic morphology of *Cylindrocladium spathiphylli*.

- A : A single stipe arose from hyphal cell and terminated in a spatulate (A) vesicle. Conidiophores were borne laterally from the stipe and produced conidia in a palisade-like cluster. The bar indicates 100 μm .
- B : Scanning electron micrograph of conidiophores and phialids bearing immature conidia. The bar indicates 20 μm .
- C-F : Capitata (C), spatulate (D), ellipsoid (E) and bicellular (F) terminal vesicles of stipe. The bars indicate 20 μm .
- G : Uni-, bi-, and tri-septate conidia of *C. spathiphylli*. The bar indicates 50 μm .