Botanical Studies (2009) 50: 69-72.

Piptocephalis formosana, a new species from Taiwan

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(Received February 15, 2008; Accepted July 30, 2008)

ABSTRACT. *Piptocephalis formosana,* isolated from forest soil in Taiwan, is described as new. Compared with similar species, *P. formosana* differs in having smaller head cells that are 4-5 lobed, cylindrical merosporangia containing (2-)3(-4) merospores, and smaller merospores surrounded by a water droplet when mature.

Keywords: *Piptocephalis formosana*; Taiwan; Zygomycetes.

INTRODUCTION

Species of *Piptocephalis* de Bary (Piptocephalidaceae, Zoopagales, Zygomycota) are obligate parasites of other fungi, mainly Mucorales, and usually can be isolated from herbivore dung, soil or leaf litter. The sporophores are dichotomously branched several times and terminate in a usually sterile deciduous head cell. Many rod-shaped merosporangia, containing a variable number of merospores, are born on the head cell. The mature spores remain dry or are enclosed in a liquid droplet (Kirk, 1978).

This genus contains approximately 21 species (Gräfenhan, 1998; Kirk et al., 2001; Ho, 2006), four of which have been reported in Taiwan, including one new species (Ho, 2003, 2004, 2006). In this study, we describe a species of *Piptocephalis* isolated from a soil sample collected from Yangmingshan National Park, Taipei, Taiwan. It has features much like those of *P. cruciata* Tiegh. (van Tieghem, 1875), *P. debaryana* B. S. Mehrotra (Mehrotra, 1960) and *P. freseniana* de Bary (de Bary, 1865). However, it can be distinguished from these three species by smaller head cells and smaller merospores.

MATERIALS AND METHODS

Soil samples were collected from Yangmingshan National Park, Taipei and brought back to the laboratory in sterilized plastic bags. Two to three milligrams of soil particles were placed on 1.7% corn meal agar (Becton Dickinson) plates. The plates were incubated at 24°C for nearly a week and were observed under a dissecting microscope. Sporophores of *Piptocephalis* were transferred along with their host to fresh corn meal agar plates and incubated at 24°C. After one week, the mature spores of *Piptocephalis* were transferred again by touching mature merosporangia with a sterilized needle to pre-marked spots on fresh corn meal agar plates. One day after inoculation of *Piptocephalis* merospores, the spores of the host were inoculated in the vicinity of the parasite. After 4-7 days, the host was parasitized by the *Piptocephalis* species.

Microscope slides were prepared from ten-day-old cultures using tap water or lactic acid-cotton blue (cotton blue, 0.5 g; 90% lactic acid, 1L) as mounting media (Kurihara et al., 2000). They were observed and photographed using a Leica MPS32 light microscope (LM). For scanning electron microscopy (SEM), pertinent materials were selected using a dissecting microscope and fixed for 1 h with 2.5% glutaraldehyde in distilled water and then post-fixed for 1 h with 1% osmium tetraoxide in distilled water. The specimens were washed with distilled water and dehydrated in a graded acetone series. Specimens were dried in a critical point dryer, coated with gold, and observed with a Hitachi S-520 scanning electron microscope at 20 KV.

TAXONOMY

Piptocephalis formosana H.M. Ho & P.M. Kirk, sp. nov. Figures 1 and 2

Hyphae vegetativae plerumque submersae, hyalinae. Sporophora erecta vel ascendentia, postea prostrata et distanter septata, longitudinaliter striata; stipites principales ad 13 mm longi, 3.0-4.5 μm lati, constantes ex ramificationibus successivis usque ad 4, ramosi dichotome, tripartiti vel quadripartiti rami basiles 160-480 × 3.5-4.5

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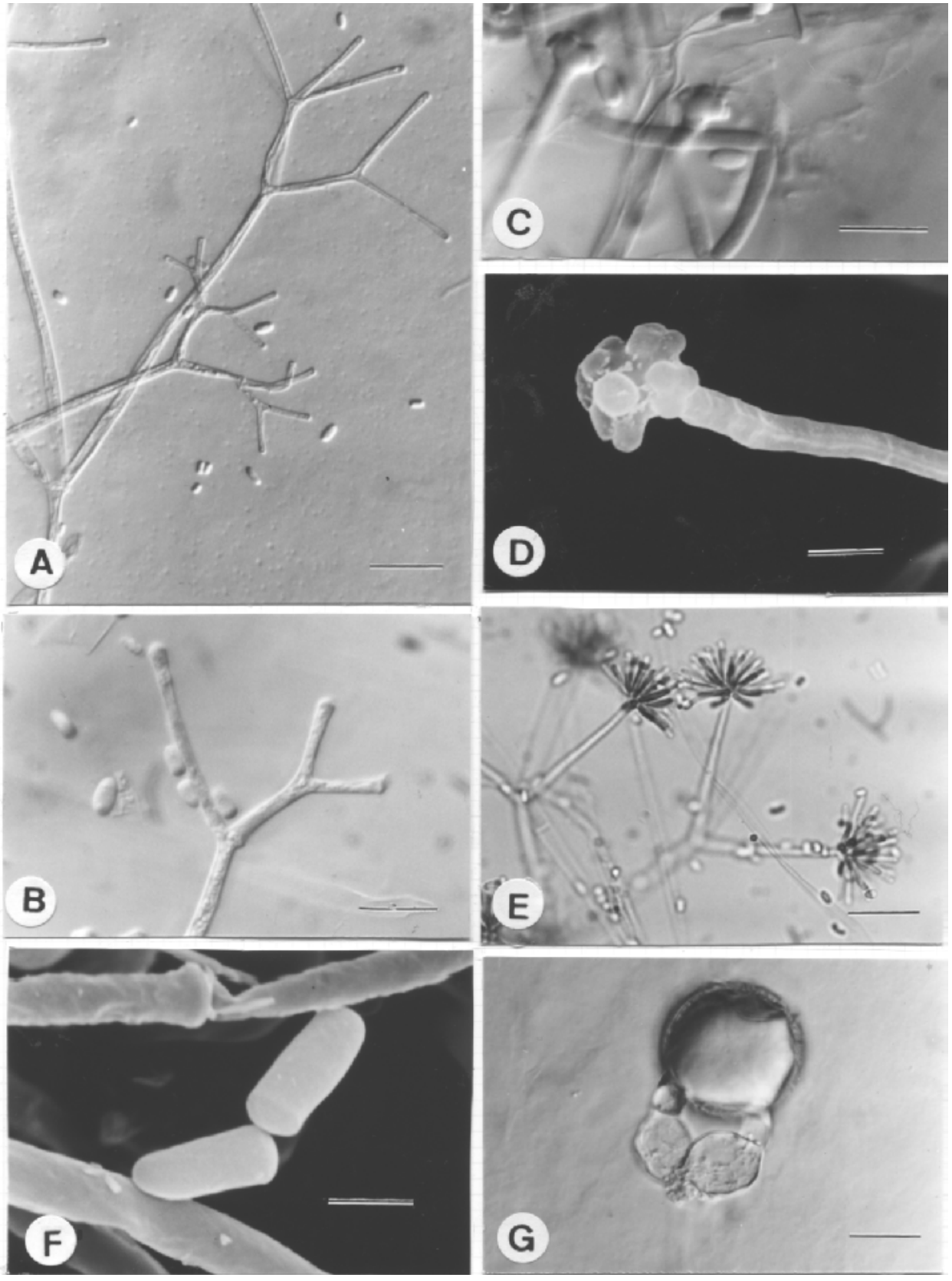

Figure 1. *Piptocephalis formosana*. A-C, E, G, LM; D, F, SEM; A, Terminal branch of a sporophore with the head cells and merosporangiospores detached. Bar = 20 μm; B, Terminal portion of sporophore with merospores detached. Bar = 10 μm; C, Terminal portions of two sporophores showing head cells with merospores detached. Bar =10 μm; D, Apex of a terminal branch showing the lobes of head cells with merospores detached. Bar = 2 μm; E, Distal end of sporophores showing head cells bearing merosporangia. Bar = 20 μm; F, Detached merospores. Bar = 3.8 μm; G, A zygospore with two suspensors. Bar = 20 μm.

µm; rami paenultimi 20-80 × 2.5-3.5 µm; rami termiles 28-47 × 1.5-2.0 µm. Cellulae capituli deciduae, conica, projecturis lobatis, 4.5-5.5 µm diam, merosporangis 11-18 praeditae. Merosporangia trispora. Sporangiosporae cylindratae, laeves, hyalinae, (2.5-)3.0-3.5(-4.0) × (1.0-)2.0 µm, Zygosporae super vel sub pagina agari factae, globosae, verrucosae, 42.5-47.5 µm diam, brunneolae. (Holotypus: TNM F21839).

Vegetative hyphae usually submerged, hyaline. Sporophores originally erect or ascending, prostrate later, smooth-walled, hyaline when young becoming light yellow and striate in age; sometimes with shorter, erect sporophores arising from rhizoids. Basal main stalks up to 13 mm long, 3.0-4.5 µm wide, septate, fertile branch system arising from main stalk consisting of up to four successive ramifications, branching di- to quadrichotomously (Figures 1A and 2A), usually non-septate; primary branches 160-480 × 3.5-4.5 µm, forming (2-)3-4(-5) branches in a whorl; penultimate branches 20-80 × 2.5-3.5 µm, branching di- or trichotomously; terminal branches 28-47 × 1.5-2.0 µm, branching di- or trichotomously, slightly swollen at top (Figure 1B). Head cells deciduous, conical, with 4-5 lobed projections (Figures 1C, D and 2B-D,), 4.5-5.5 µm diam, bearing 11-20 merosporangia (Figures 1E and 2E-G). Merosporangia cylindrical, containing (2-)3(-4) merospores. Merospores cylindrical, the basal ones with the proximal end rounded, the apical ones with the distal end rounded, smooth-walled (Figures 1F and 2H), hyaline, (2.5-)3.0-3.5(-4.0) × (1.0-)1.5-2.0 µm, with spore heads

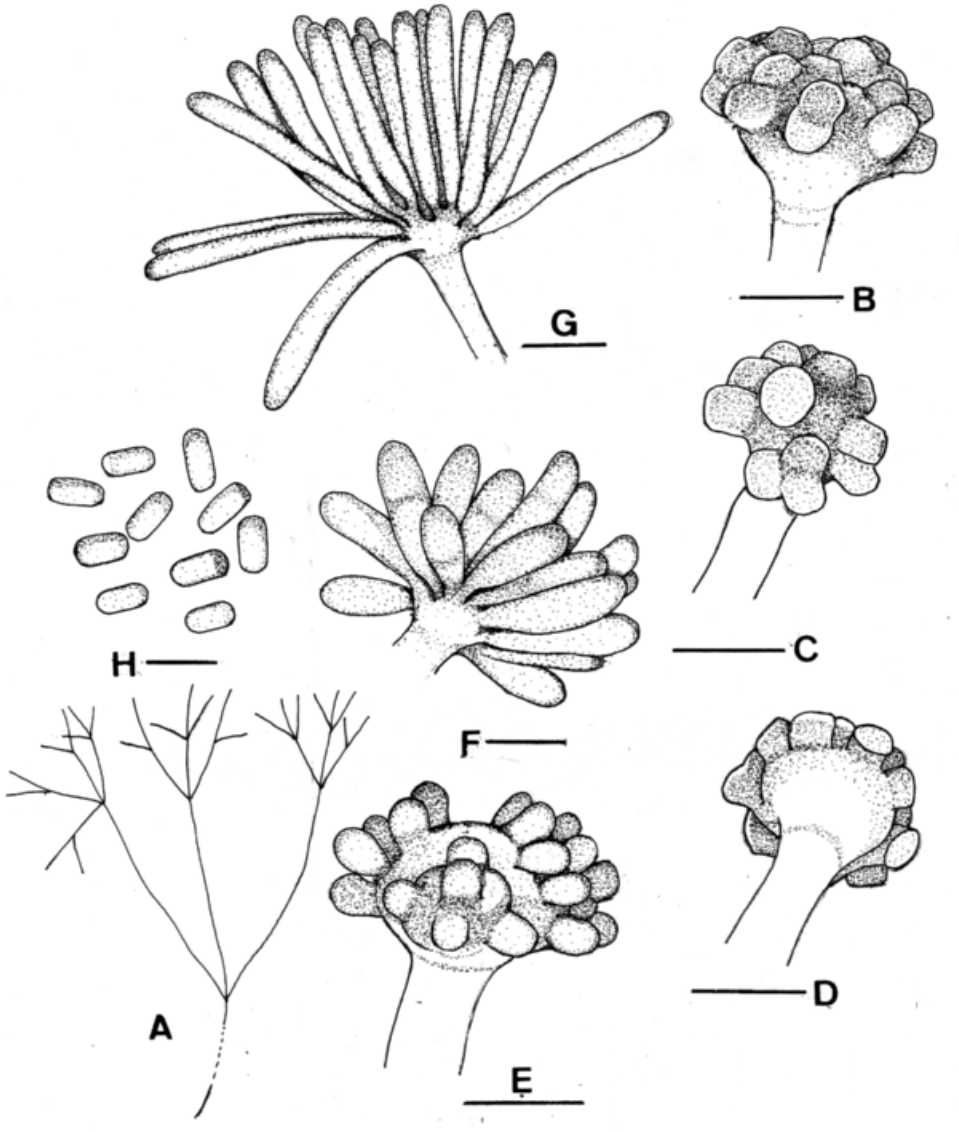

Figure 2. *Piptocephalis formosana*. A, Upper portion of a sporophore showing branching pattern; B, A head cell with merosporangia detached. Bar = 5 µm; C, A head cell with merosporangia detached. Bar = 2.5 µm; D, A head cell with merosporangia detached, bottom view. Bar = 2 µm; E, A head cell with merosporangial primordia. Bar=2 µm; F, A head cell with young, developing merosporangia. Bar = 2 µm; G, A head cell with young merosporangia. Bar = 2 µm; H, Merospores. Bar = 5 µm.

forming liquid droplets at maturity. Zygospores formed on or under the surface of agar, globose; exospores roughened, 42.5-47.5 µm diam, light brown; endospore smooth, with swollen suspensors (Figure 1G).

Holotype. **TAIWAN.** Taipei City, Yangmingshan National Park, from soil, parasitizing *Mucor* sp., coll. Apr 2004, H.M. Ho *SYMC 0302*. A living culture deposited with CABI Europe-UK (IMI 392502), a dry culture deposited at the National Museum of Natural Science, Taichung, Taiwan (TNM F21839).

Etymology. Referring to Taiwan where the fungus was collected.

Commentary. *Piptocephalis formosana* resembles *P. cruciata, P. debaryana*, and *P. freseniana* in numbers of merospores within each merosporangium, lobed head cells and spore heads forming a water droplet at maturity. The head cells of *P. formosana* are 4.5-5.5 µm, smaller than those of *P. cruciata, P. debaryana,* and *P. fresemoama,* which are 6.5-15 µm, 7-15 µm, and (5-)6-19.5 µm, respectively (Gräfenhan, 1998). Also, the merospores of *P. formosana* are 3.0-3.5 × 2 µm, smaller than those of the three aforementioned species, 4-7.5 × 2.5-3 µm in *P. cruciata*; 3-7 × 2.5 µm in *P. debaryana*, and 4-9 × 2.5-3.5 µm in *P. freseniana*. Also, the branching system is tri- or quadrichotomously branched in *P. formosana* as opposed to dichotomously branched in *P. freseniana*. *P. cruciata* also differs from *P. formosana* in having (3-)4-6(-8) merospores in each merosporangium.

Acknowledgements. This study was supported by Grant NSC92-2621-B-152-001 from the National Science Council, Taiwan, ROC.

LITERATURE CITED

De Bary, A. 1865. Zur Kenntnis der Mucorinen. Abh. Senckenberg. Naturf. Ges. **5:** 345-375.

Gräfenhan, T. 1998. Taxonomic revision of the genus *Piptocephalis* (Fungi). Master's thesis. Mathematisch-Naturwissenschaftlichen Fakultät der Ernst-Moritz-Arndt-Universiät. Greifswald, Germany, 102 pp.

Ho, H.M. 2003. The Merosporangiferous Fungi from Taiwan (III): Three New Records of Piptocephalidaceae (Zoopagales, Zygomycetes). Taiwania **48:** 53-59.

Ho, H.M. 2004. The Merosporangiferous Fungi from Taiwan (IV): Two New Records of *Piptocephalis* (Piptocephalidaceae, Zoopagales). Taiwania **49:** 188-193.

Ho, H.M. 2006. A new species of *Piptocephalis* from Taiwan. Bot. Stud. **47:** 453-456.

Kirk, P.M. 1978. A new and unusual species of *Piptocephalis* (Mucorales). Trans. Brit. Mycol. Soc. **70:** 335-340.

Kirk, P.M., P.F. Cannon, J.C. David, and J.A. Stalpers. (eds.) 2001. Dictionary of the Fungi. 9th. (ed.), CABI International, Wallingford, UK. 655 pp.

Kurihara, Y., S. Tokumasu, and C-Y. Chien. 2000. *Coemansia furcata* sp. nov. and its distribution in Japan and Taiwan. Mycoscience **41:** 579-583.

Mehrotra, B.S. 1960. Studies on Mucorales III: *Piptocephalis debaryana* sp. nov. Proc. Natl. Acad. Aci. India B **30:** 370-372.

Van Tieghem, P. 1875. Nouvelles recherches sur les Mucorinées. Ann. Sci. Nat. Bot. Sér. 6 **1:** 5-175.

台灣產一新種：台灣頭珠黴

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本文描述一種由土壤中分離的新種台灣頭珠黴，主要特徵為具有 4-5 裂之頭細胞，其大小較相近屬為小、柱狀孢子囊含有 (2-)3(-4) 個孢子以及孢子成熟時形成一水珠，孢子亦較相近屬為小。文中並提供圖示、描述及與與相近屬之比較。

關鍵詞： 台灣頭珠黴 ； 台灣 ； 接合菌綱。