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The Merosporangiferous Fungi from Taiwan (III): Three New Records of Piptocephalidaceae (Zoopagales, Zygomycetes)

Hsiao-Man Ho

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ABSTRACT: Three merosporangiferous fungi: *Piptocephalis indica* B. S. Mehrotra & Baijal, *Syncephalis cornu* van Tieghem & Le Monnier and *S.* cf. *ventricosa* van Tieghem are reported for the first time from Taiwan. Descriptions, photographs and variations noted for their morphological characters are provided.

KEY WORDS: Merosporangiferous fungi, Piptocephalidaceae, Taiwan, Zygomycetes.

INTRODUCTION

The family Piptocephalidaceae encompasses the genus *Syncephalis* and the genus *Piptocephalis* (Fitzpatrick, 1930). The diagnostic characters of this family are the cylindrical–shaped merosporangia which born on simple or branched aerial sporangiophores and the warty zygospores which born on tongs-like suspensors (Kirk *et al*., 2001). Species of Piptocephalidaceae are obligate parasites of other fungi, mainly species of Mucorales, usually can be isolated from soil or dung. *Piptocephalis* species are characterized by the sporangiophores which are usually branched near the top to produce an inflorescence-like series of regularly dichotomous branches. At the branch apex, there is a relatively short, broad head cell bearing many uniseriate merosporangia containing a variable number of spores. *Syncephalis* species are relatively small in size and inconspicuous, with simple sporangiophores arising from branched, short rhizoids. A terminal, globoid or turbinate head is formed by the sporangiophore and from which giving rise to small or large number of merosporangia, which have few- to many-spores (Benjamin, 1959; Zycha *et al*. 1969.).

Ho (2000, 2001 and 2002) reported five species of *Syncephalis* from Taiwan, and hitherto none of *Piptocephalis* species have been reported from this island. In this paper, the author describes one new record of *Piptocephlis* and two additional new records of *Syncephalis* from Taiwan. The morphological characters of these fungi are described with photos taken with light and scanning electron microscopy. Methods of light and scanning electron microscopy followed that of Ho (2002). All examined specimens, slides and pure cultures are deposited in the mycology laboratory, Department of Natural Science Education, National Taipei Teachers College, Taipei, Taiwan.

TAXONOMY

Piptocephalis indica B. S. Mehrotra & Baijal, Sydowia, Ann. Mycol. Ser. II, 17, 171-173, 1963. Figs. 1A-F

1. Department of Natural Science Education, National Taipei Teachers College, No. 134, Sect., HoPing E. Rd., Taipei, Taiwan. E-mail: ho@tea.ntptc.edu.tw

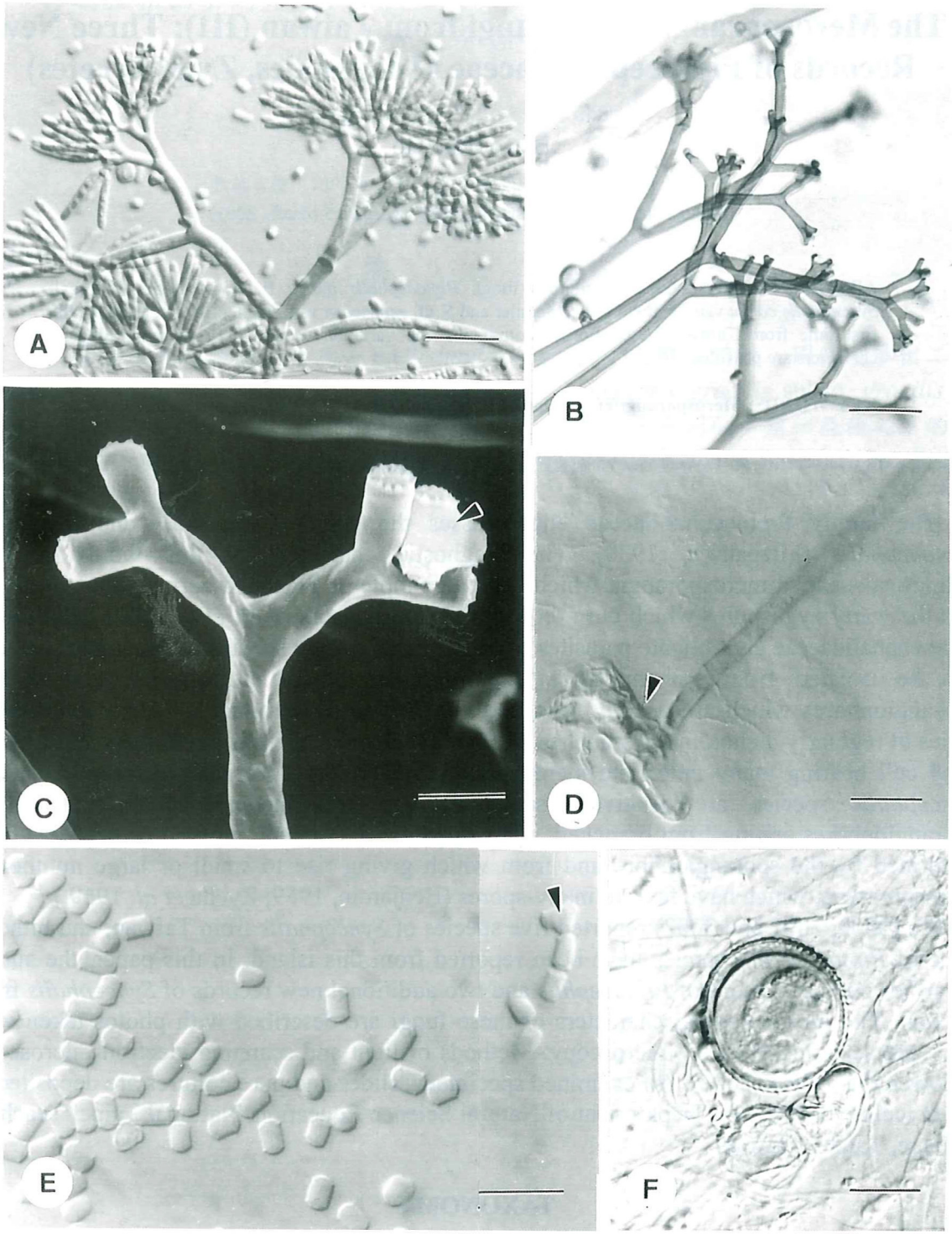

Fig. 1. *Piptocephalis indica.* A, B, D-F, LM; C, SEM. A. Upper portion of a young sporangiophore showing the branching pattern. Bar = 20 μm. B. Upper portion of a sporangiophore after the merosporangia detached. Bar = 20 μm. C. Terminal dichotomous branch of a sporangiophore after the head cell detached. Note the detached, lobed head cell (arrow head). Bar = 2.5 μm. D. Rhizoid on the base of the sporangiophore (arrow head). Bar = 20 μm. E. Spores and head cell (Arrow head). Bar = 10 μm. F. Zygospore. Bar = 20 μm.

Colonies on *Cunninghamella* sp. on corn meal agar at first white later turning grayish brown; vegetative mycelia becoming septate, much branched. Sporangiophores erect, with rhizoids at the base; main stalks 4-5 (-7) μm in diameter, longitudinally striate, septate; branched dichotomously or with whorls of 2-4 primary branches which later again branching into 3 or 4 successive dichotomies; ultimate branches 3.1-4.0 μm long, 2-3 μm in diameter. Head cells small, 4.0-4.5 μm in diameter, heart shaped in side view, with lobes 2-6, usually 3 lobed, each lobe with a merosporangium; the latter about 30 μm long, with 3-7 spores. Sporangiospores oblong, smooth, 2-2.5 × 3.8-5.0 (-6) μm. Membranes derived from sporangial wall remained on the surface of the spores forming fringes on both ends of the spores. Homothallic. Zygospores formed under or on the surface of the agar media, globose, golden brown, finely warted, 30-47.5 μm in diameter.

Note: The heart shaped head cells found in my isolate are known in three species, i.e. *Piptocephalis xenophila* Dobbs & English, *Piptocephalis microcephala* van Tieghem and *P. indica*. My isolate resembles *P. indica* and *P. microcephala* in the presence of rhizoids, striate sporangiophores and the size of the head cells which roughly varying from 3-4 μm. However, *P. microcephala* have smaller merosporangia which contains only 3 spores in each at most, while in *P. indica,* the merosporangia are with 4-7 spores as were observed in my isolate. Thus the author identified this isolate as *P. indica*.

Material examined: *SHI0104*, from soil, Taipei city, Nov. 2000; *SYMC 0101*, from soil, Yangmingshan, Taipei, Nov. 2001.

Distribution: India (Mehrotra & Baijal, 1964), Taiwan.

Syncephalis cornu van Tieghem & Le Monnier, Ann. Sc. Nat. 5. ser. 17: 346, 1873.
Figs. 2A-F

Vegetative mycelia on *Mucor* sp. slender, about 1 μm wide, smooth, hyaline, running over the host. Sporangiophores originating from rhizoids, at first straight, simple, 78-90 μm high (rhizoid excluded), 4.6-6.3 μm wide at the narrowest point near the base, enlarging gradually upward to 10-15 μm wide near the fertile vesicle, bent at this region, then narrowing down to 5.0-6.3 μm wide just below the fertile head, usually single, attached to the host hyphae by stout, dichotomously branching rhizoids. Fertile heads oval to subglobose, 18.8-25.0 μm high by 15-23.8 μm wide, bearing over 40 unbranched merosporangia on its upper hemisphere. Merosporangia cylindrical, slightly curved, each mature merosporangium containing four spores. Spores ellipsoidal, 4.5-7.5 × 2.2-2.7 μm, with minute spines on the wall of the spores. Head collapsed after the spores released. Conspicuous warts left on the upper surface of the head after detachment of the merosporangia. At maturity, spores held in a brown liquid droplet on the top of the sporangiophores. Zygospores not observed.

Note: The distinguishing character of this species is the bending sporangiophore which enlarging at the bending portion. The similar allied species is *S. reflexa*, however, the latter without enlarging portion on the sporangiophore and having smaller spores.

Material examined: *DPP0102*, from pigeon dung, Pingtong city, April 2000.

Distribution: China (Ou, 1940), France (van Tieghem & Le Monnier, 1873), India (Mehrotra & Prasad, 1965), Japan (Indoh, 1962), Java (Boedijn, 1958), North America (Thaxter, 1897), Taiwan.

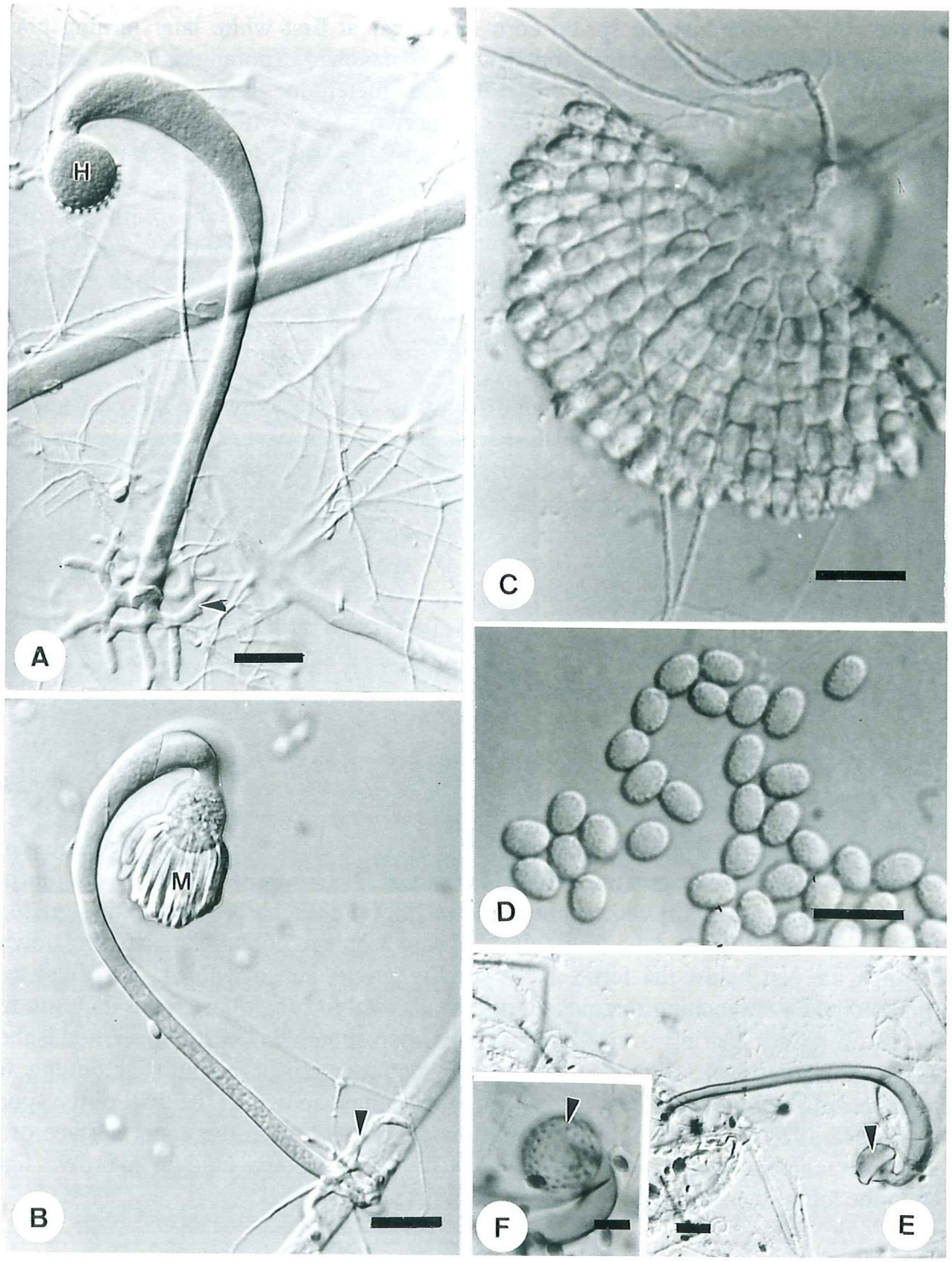

Fig. 2. *Syncephalis cornu.* A-F, LM (ICT). A. Sporangiophore with head (H) bearing merosporangial primordia, note the stout and branching rhizoid (arrow head). Bar = 20 μm. B. Sporangiophore with young merosporangia (M) on the head, note the rhizoid (arrow head) anchoring the host hyphae. Bar = 20 μm. C. Merosporangia fragmented into spores. Bar = 10 μm. D. Spores with fine spines on the surface. Bar = 10 μm. E. Sporangiophore with collapsed head (arrow head). Bar = 20 μm. F. Fertile head with warts (arrow head) after merosporangia detached. Bar = 10 μm.

Syncephalis cf. **ventricosa** van Tieghem, Ann. Sc. Nat. 6. ser. 1, 132-135, 1875.

Figs. 3A-B

Sporangiophores 80-147 µm high, the narrowest part just beneath the fertile head, about 2-5 µm in diameter, thickening toward the base, with widest portion about 7.5-10 µm in diameter. The basal part of sporangiophore becoming subglobose, 7.5-17.7 µm in diameter. Fertile head hyaline, oval, globose, 7.5-12.5 × 7.5-13.0 µm. Merosporangia growing over the upper half surface, 4-5 spores in each merosporangium. Spores hyaline, cylindrical, ellipsoidal, 2.5-3 × 2-2.5 µm.

Note: The author identified this isolate to be *S.* cf. *ventricosa*, mainly based on its swollen basal portion of the sporangiophore. Moreover, this isolate has the following common characters with van Tieghem's *S. ventricosa* (1875): the height of sporangiophores and the size of spores. However, this isolate produces cylindrical, ellipsoidal spores, but van Tieghem's fungi produce globose spores.

Material examined: *SKT0103*, soil from Kenting National Park, Pingtong, Jan 2000.

Distribution: France (van Tieghem, 1875), Taiwan.

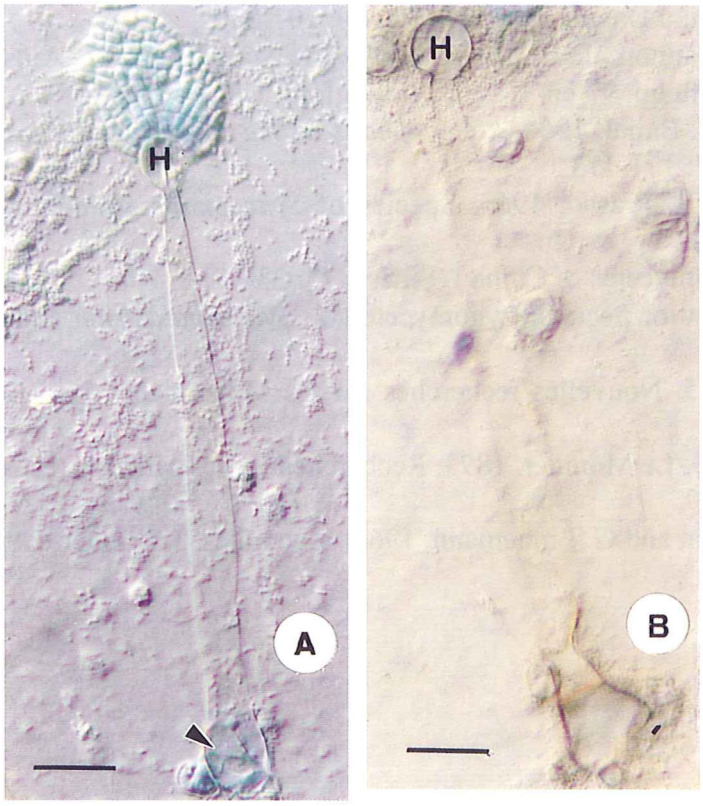

Fig. 3. *Syncephalis* cf. *ventricosa.* A-B, LM (ICT). A. One sporangiophore with a head (H) bearing merosporangia, note the swollen basal portion (arrow head). Bar = 40 µm. B. One sporangiophore with a head (H) after merosporangia detached. Bar = 40 µm.

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台灣管狀孢子囊真菌之研究 (III): 三種頭珠黴科新紀錄種

何小曼

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摘　　要

本文報告三種管狀孢子囊眞菌 (頭珠黴科，接合菌綱): 印度頭珠黴(*Piptocephalis indica* B. S. Mehrotra & Baijal), 彎梗集珠黴 (*Syncephalis cornu* van Tieghem & Le Monnier) 及腫梗集珠黴 (*S.* cf. *ventricosa* van Tieghem)。三者均為台灣的新紀錄種，文中提供其型態描述、照相，並對形態變異予以簡短討論。

關鍵詞：管狀孢子囊真菌，頭珠黴科，台灣，接合菌綱。

1. 國立台北師範學院自然科學教育學系，臺北市 106 和平東路 2 段 134 號，台灣。