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Three new species of corticioid fungi from Taiwan

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ABSTRACT. This paper reports three new species of corticioid fungi collected from Taiwan. They are *Dentipellis taiwaniana*, *Peniophora formosana,* and *Phanerochaete granulata*. *Dentipellis taiwaniana* resembles *D. microspora* in sharing small basidiospores while the latter differs in having numerous dendrohyphidia in the hymenium. Further, *D. microspora* occurs on gymnosperms in the temperate region of NE China while *D. taiwaniana* was found on angiosperms in subtropical lowland Taiwan. A key to the six known species of *Dentipellis* is provided. *Peniophora subsalmonea* seems to be most closely allied to *P. formosana*, by resemblance of general morphological features. The former is a tropical species, recorded from Reunion Island in the Indian Ocean while the collection of *P. formosana* was made from the high mountain temperate belt of Taiwan. Moreover, the lamprocystidia of *P. subsalmonea* are shorter and wider than those of *P. formosana*, and the gloeocystidia of *P. subsalmonea* are distinctly thick-walled, except for the thin-walled apical parts, and sometimes pointed at apices. In contrast the gloeocystidia of *P. formosana* are slightly thick-walled and obtuse at apices. Moreover, the basidiospores of *P. subsalmonea* are smaller than those of *P. formosana*. Finally, *Phanerochaete granulata* is characterized by having a grandinioid hymenial surface, a lack of cystidia, and small basidiospores.

Keywords: Basidiomycota; Corticiaceae; *Dentipellis*; New species; *Peniophora*; *Phanerochaete*; Taiwan; Taxonomy.

INTRODUCTION

Corticioid fungi are Homobasidiomycetes with resupinate basidiocarps, and the majority of these species have been referred to the family Corticiaceae Herter (Donk, 1964; Parmasto, 1986; Hjortstam, 1997; Wu, 1997a). Most of them are wood-decaying fungi, which play an important role in nutrient recycling in forest ecosystems and elsewhere in nature. Recently evidence derived from molecular studies has revealed that the corticioid fungal genera are present in all major clades of Homobasidiomycetes (Larsson et al., 2004; Binder et al., 2005). Hence, the corticioid fungi represent a polyphyletic group in the Homobasidiomycetes.

This paper presents three new species of corticioid fungi from Taiwan. The new species *Dentipellis taiwaniana* represents the sixth species accommodated in this genus (Stalpers, 1996), and this is the first report of *Dentipellis* Donk from Taiwan. *Peniophora* Cooke is a fairy large genus among corticioid fungi. The new species *Peniophora formosana* represents the eleventh species of this genus reported from Taiwan. For previous reports of *Peniophora* from Taiwan refer to Lin and Chen (1990), Wu (2002) and Wu (2003a). *Phanerochaete* P. Karst. is one of the largest genera among corticioid fungi, with about one hundred species known globally (Parmasto et al., 2004). Before the present study, 40 species of *Phanerochaete* were known from Taiwan (Lin and Chen, 1990; Wu, 1990, 1995, 1997b, 1998, 2000, 2003b, 2004; Maekawa, 1992). This represents a very high number when considered in a global context.

MATERIALS AND METHODS

Studied specimens have been deposited at the herbarium of National Museum of Natural Science of ROC (TNM). Descriptions of basidiocarps were based on dried specimens. Free-hand thin sections of basidiocarps were prepared for microscopic studies. For observations and measurements of microscopic characters, 5% KOH was used as the standard mounting medium for all measurements, to ensure that spores have rehydrated. Melzer's reagent (IKI) was used to detect amyloidity and dextrinoidity, cotton blue (CB) to determine cyanophily, and sulphoaldehyde (SA) to detect any sulphuric reaction of gloeocystidia, the bluish black color change indicating a positive reaction. Measurements of basidiospore lengths and widths are based on the side view—adaxial and abaxial sides. Apiculi and ornamentation are excluded in spore measurements.

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TAXONOMY

Dentipellis taiwaniana Sheng H. Wu, sp. nov.

Figure 1

Etymology. From taiwanianus (referring to Taiwan), in accordance with the place where the type specimen was found.

Holotype. **TAIWAN.** TAICHUNG HSIEN: Taichung Metropolitan Park, 24°13' N, 120°35' E, alt. 200 m, on rotten trunk of *Cinnamomum camphora*, Jun. 06, 2004, *Wu 0406-4* (TNM F17066).

Basidiocarpum resupinatum, effusum, submembranaceum, 120-250 μm crassum; superficies hymenialis hydnoidea. Systema hypharum monomiticum; hyphae fibulatae. Gloeocystidia numerosa, tubuliformia, 3-8 μm diam, SA-. Basidia clavata, 15-23 × 3-4 μm, 4 sterigmatibus. Basidiosporae ellipsoideae, aculeatae, tenuitunicatae, 2.7-3.3 × 2-2.4 μm, IKI lividae, CB-.

Fruit body resupinate, effuse, fairly soft, adnate, submembranaceous (aculei membranaceous-subceraceous), 120-250 μm thick in section (aculei excluded). Hymenial surface hydnoid, aculei ivory yellow, whitish between aculei; margin whitish, thinning, byssoid. Aculei 5-7 per mm, separate, subulate, 80-120 μm wide, up to ca. 1 mm long.

Hyphal system monomitic; hyphae nodose-septate. Subiculum fairly uniform, composed of medullary layer, with fairly loose texture; hyphae colorless, variously oriented, sparsely or moderately ramified, distinct, fairly straight, 2-3.5 μm diam, with 0.3-1 μm thick walls. Subhymenium slightly thickening, with dense texture; hyphae colorless, 1.5-2 μm diam, thin-walled. Trama with dense texture; hyphae colorless, mainly vertical, similar to those in subiculum. Gloeocystidia numerous, immersed or slightly emergent, colorless, long cylindrical or tubular, slightly flexuous, 3-8 μm diam, up to ca. 300 μm long, with 0.5-1.5 μm thick walls, SA-. Basidia clavate, 15-23 × 3-4 μm, 4-sterigmate. Basidiospores ellipsoid, adaxially slightly concave, aculeate (smooth in KOH), thin-walled, 2.7-3.3 × 2-2.4 μm, IKI bluish black, CB-.

Distribution. Known only from Taiwan.

Remarks. Ginns (1986) critically studied all species referred to *Dentipellis* and accepted three species in this genus, *viz. D. dissita* (Berk. & Cooke) Maas G., *D.*

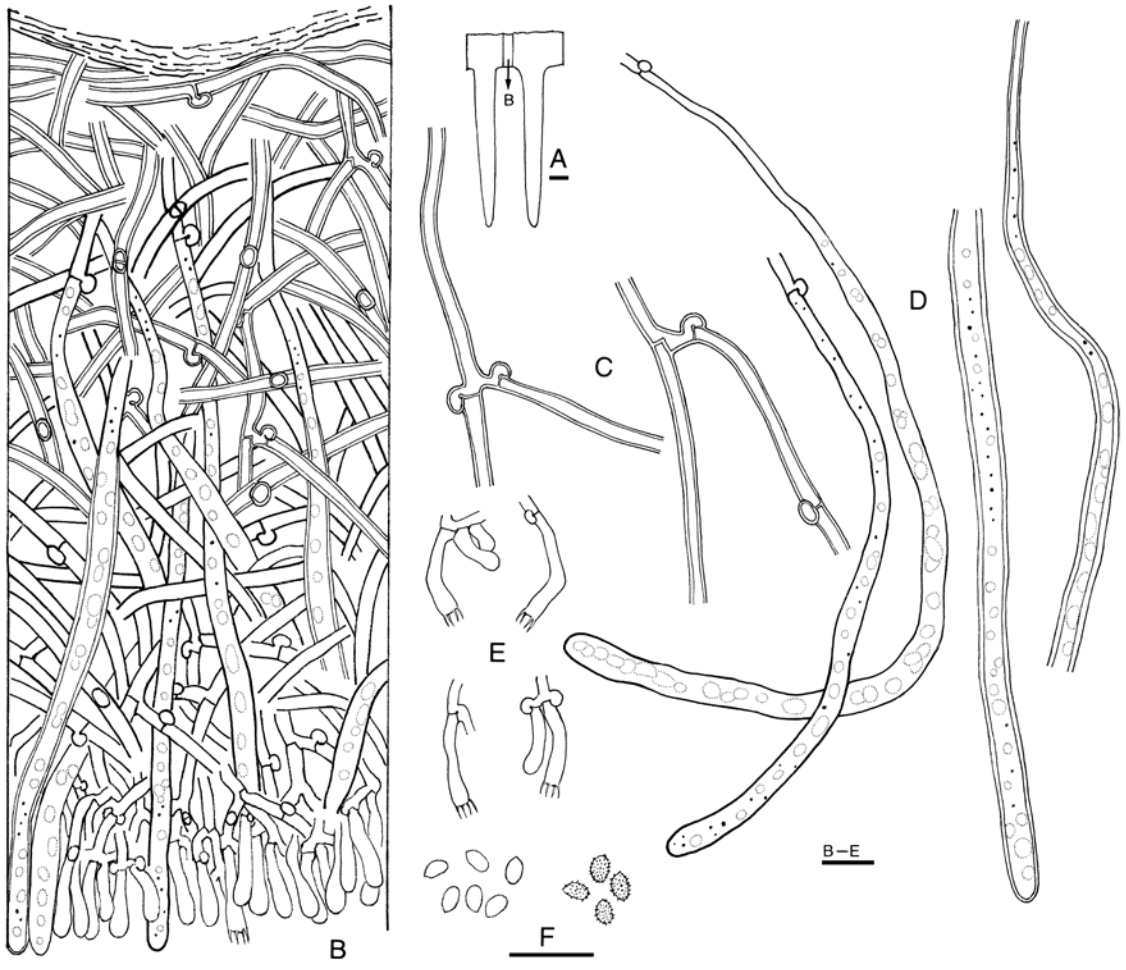

Figure 1. *Dentipellis taiwaniana* (holotype). A, Profile of basidiocarp; B, Basidiocarp section; C, Subicular hyphae; D, Gloeocystidia; E, Basidia; F, Basidiospores (left: in KOH, right: in IKI). Scale bars (A= 100 μm; B-F = 10 μm).

fragilis (Pers.:Fr.) Donk, and *D. leptodon* (Mont.) Maas G. Stalpers (1996) proposed a new combination, *D. parmastoi* (Nikol.) Stalpers, based on *Amylodontia parmastoi* Nikol. Dai (1998) further presented a new species, *D. microspora* Y.C. Dai, based on two collections made from Changbaishan of NE China. Among *Dentipellis*, *D. taiwaniana* and *D. microspora* share the feature of small and similar-sized basidiospores. The latter species is distinguished from the former in having numerous dendrohyphidia in the hymenium, and this structure is lacking in the former. In addition, *D. microspora* occurs on gymnosperm wood of temperate region of NE China, while *D. taiwaniana* was found on angiosperm wood of subtropical lowland Taiwan. A key to the six known species of *Dentipellis* is given below.

Key to Species of Dentipellis

1. Basidiospores < 4 µm long 2
1. Basidiospores > 4 µm long 4
2. Basidiospores > 3.2 µm long, > 2.4 µm wide ..... *D. leptodon*
2. Basidiospores < 3.3 µm long, < 2.4 µm wide 3
3. Temperate species known from temperate NE China. On gymnosperm. Dendrohyphidia present .... *D. microspora*
3. Subtropical species known from subtropical lowland Taiwan. On angiosperm. Dendrohyphidia absent ..... *D. taiwaniana*
4. On gymnosperm wood. Gloeocystidia rare ..... *D. parmastoi*
4. On angiosperm wood. Gloeocystidia numerous 5
5. Basidiospores mostly > 5 µm long , mostly > 4 µm wide ..... *D. fragilis*
5. Basidiospores mostly < 5 µm long , mostly < 4 µm wide ..... *D. dissita*

Peniophora formosana Sheng H. Wu, sp. nov.

Figure 2

Etymology. From formosanus (referring to Formosa, an old name for Taiwan), in accordance with the place where the type specimen was found.

Holotype. **TAIWAN.** TAICHUNG HSIENG: Anmashan, 24°16' N, 121°00' E, alt. 2,250 m, on branch of angiosperm, Dec 5, 2001, *Wu 0112-20* (TNM F13835).

Basidiocarpum resupinatum, effusum, membranaceum, 50-150 µm crassum; superficies hymenialis plana. Systema hypharum monomiticum; hyphae fibulatae. Gloeocystidia numerosa, cylindrica vel clavata, 40-60 × 8-20 µm, SA+. Lamprocystidia 35-55 × 6-9 µm. Basidia subclavata, 28-38 × 5.5-6.5 µm, 4 sterigmatibus. Basidiosporae anguste ellipsoideae, laeves, tenuitunicatae, (7.5-) 8-9 (-9.2) × 3-3.7 µm, IKI-, CB-.

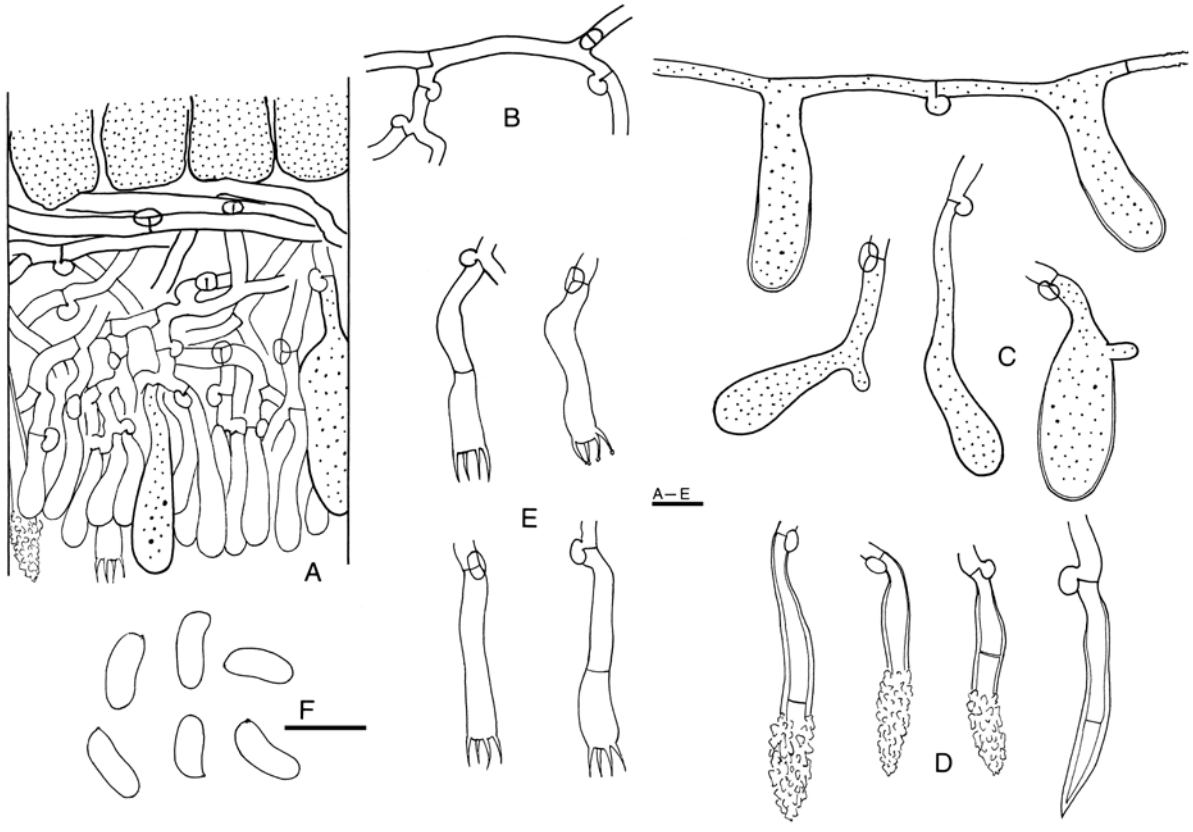

Figure 2. *Peniophora formosana* (holotype). A, Basidiocarp section; B, Subicular hyphae; C, Gloeocystidia; D, Lamprocystidia; E, Basidia; F, Basidiospores. Scale bars = 10 µm.

Basidiocarp resupinate, effuse, adnate, membranaceous, 50-150 μm thick in section. Hymenial surface clay-yellow or buff-colored, smooth, occasionally cracked; margin thinning, paler, filamentose.

Hyphal system monomitic; hyphae nodose-septate. Subiculum composed of a thin basal layer and a medullary layer which makes up a fairly loose texture; hyphae colorless, 2.5-4.5 μm diam., generally thin-walled, basal hyphae occasionally slightly thick-walled. Hymenium more or less thickening, with dense texture; hyphae colorless, mainly vertical, thin-walled. Gloeocystidia numerous, colorless or slightly yellow, cylindrical or clavate, with stalked bases, terminal or lateral, 40-60 × 8-20 μm, slightly thick-walled, SA+. Lamprocystidia not adundant, apically encrusted, colorless, 35-55 × 6-9 μm (encrustation included), with 0.7-1.5 μm thick walls. Basidia subclavate, 28-38 × 5.5-6.5 μm, 4-sterigmate. Basidiospores narrowly ellipsoid, adaxially slightly concave, smooth, thin-walled, (7.5-) 8-9 (-9.2) × 3-3.7 μm, IKI-, CB-.

Distribution. Known only from Taiwan.

Remarks. This new species belongs to the subgenus *Gloeopeniophora* (Höhn. & Litsch.) Boidin & Lanq., due to having numerous gloeocystidia and lacking brown hyphae in the basidiocarp. *Peniophora subsalmonea* Boidin, Lanq. & Gilles seems to be the most closely allied species owing to resemblance of general morphological features (Boidin et al., 1991). However, it can be distinguished from *P. formosana* by several characteristics. Firstly, *Peniophora subsalmonea* is a tropical species, reported from Reunion Island in the Indian Ocean, while the collection of *P. formosana* was made from high mountain temperate belt above 2,000 m altitude of Taiwan. Secondly, lamprocystidia of *P. subsalmonea* are shorter and wider (25-38 × 10-16(-20) μm compared to 35-55 × 6-9 μm in *P. formosana*). Thirdly, gloeocystidia of *P. subsalmonea* are distinctly thick-walled except the thin-walled apical parts, and sometimes pointed at apices. Gloeocystidia of *P. formosana* are slightly thick-walled, and obtuse at apices. Moreover, basidiospores of *P. subsalmonea* are smaller ((6.5-) 7-8.2 × 2.5-3.2 μm, according to Boidin et al. 1991) than those of *P. formosana* ((7.5-) 8-9 (-9.2) × 3-3.7 μm).

Phanerochaete granulata Sheng H. Wu, sp. nov.

Figure 3

Etymology. From granulatus (= granulate), referring to morphology of hymenial surface of this new species.

Holotype. **TAIWAN.** CHIAYI HSIEN: Yushan National Park, Nanhsi Forest Road, 23°28' N, 120°54' E, alt. 2,000

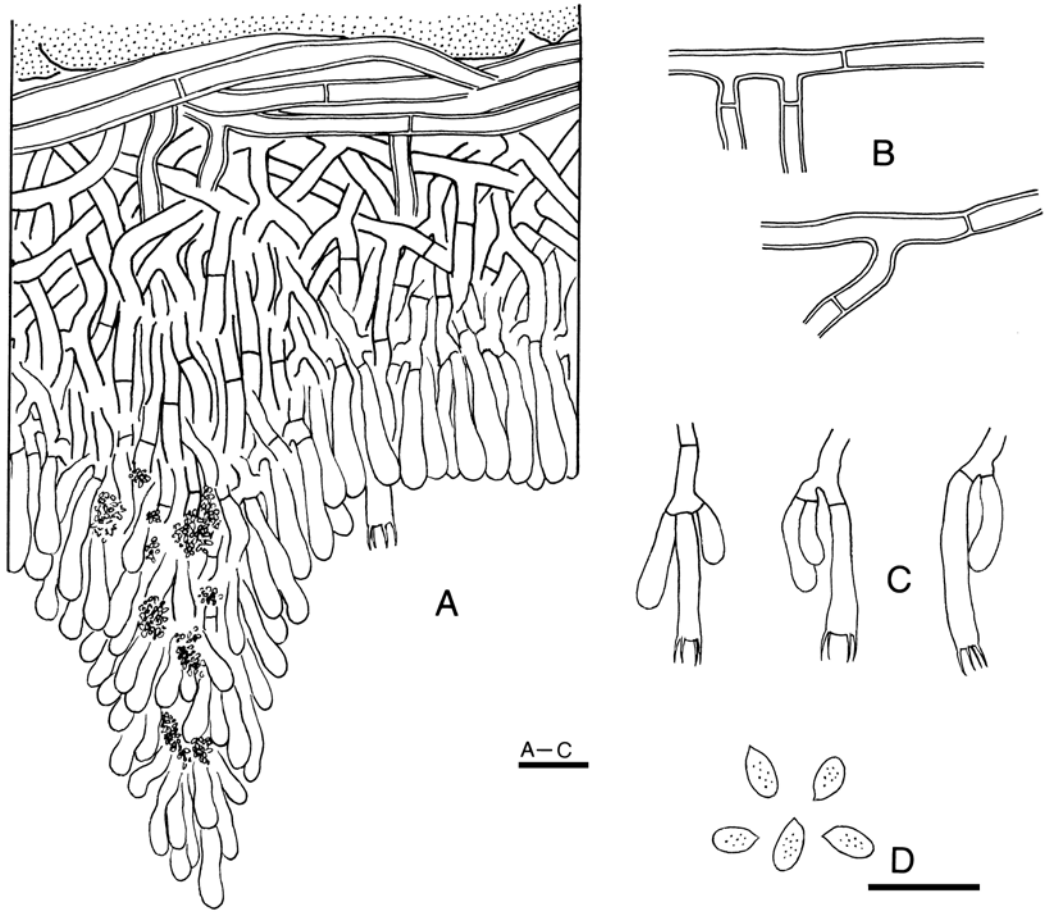

Figure 3. *Phanerochaete granulata* (holotype). A, Basidiocarp section; B, Basal hyphae; C, Basidia; D, Basidiospores. Scale bars = 10 μm.

m, on branch of angiosperm, Oct 07, 1992, *Wu 9210-57* (TNM F20057).

Basidiocarpum effusum, membranaceum, 40-100 µm crassum; superficies hymenialis grandinioidea. Systema hypharum monomiticum; hyphae efibulatae. Cystidia desunt. Basidia anguste clavata, 18-28 × 3.3-4.3 µm, 4 sterigmatibus. Basidiosporae ellipsoideae vel anguste ellipsoideae, laeves, tenuitunicatae, 3.7-4.5 × 2.2-2.7 µm, IKI-, CB-.

Basidiocarp resupinate, effuse, membranaceous, 40-100 µm thick in section (aculei excluded). Hymenial surface pale clay-colored, grandinioid, extensively cracked; aculei fairly crowded, 12-16 per mm, conical, or cylindrical with narrower apices, up to 100 µm high, up to 80 µm wide at base; margin thinning, concolourous, pruinose.

Hyphal system monomitic; hyphae simple-septate. Subiculum composed of a 10-20 µm thick basal layer with compact texture, and a medullary layer with looser texture; hyphae colorless, often glued together in basal layer, more or less separable in medullary layer, 2.5-5 µm diam., generally slightly thick-walled, basal hyphae with walls up to 1 µm thick. Hymenium slightly thickening; hyphae mainly vertical, colorless, often glued together, 2-3.5 µm diam., thin- or slightly thick-walled. Cystidia lacking. Basidia narrowly clavate, 18-28 × 3.3-4.3 µm, 4-sterigmate. Basidiospores ellipsoid or narrowly ellipsoid, smooth, thin-walled, 3.7-4.5 × 2.2-2.7 µm, IKI-, CB-.

Additional specimen examined. **TAIWAN.** CHIAYI HSIEN: Yushan National Park, Nanhsi Forest Road, 23° 28’ N, 120°54’ E, alt. 2,000 m, on branch of angiosperm, Oct. 07, 1992, *Wu 9210-51* (TNM F20056).

Distribution. Known only from Taiwan.

Remarks. This new species is characterized by having a grandinioid hymenial surface, a lack of cystidia, and small basidiospores. *Phanerochaete deflectens* (P. Karst.) Hjortstam is a European species with similar features. Its hymenial surface is smooth or minutely warted while that of *P. granulata* is regularly grandinioid, and the aculei are fairly crowded. Moreover, cystidia are present in *P. deflectens* although few are in the fruiting bodies (Eriksson et al., 1981).

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臺灣產殼狀菌三新種

吳聲華

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本文報導台灣產殼狀菌三新種，即台灣刺皮菌 (*Dentipellis taiwaniana*) 美麗筍殼菌 (*Peniophora formosana*) 和粒狀顯絲菌（*Phanerochaete granulata*）。*Dentipellis taiwaniana* 與 *D. microspora* 皆具有小型孢子，然而後者的子實層表面有許多分支狀絲狀體 (dendrohyphidia)，前者並無此構造。此外，*D. taiwaniana* 產於中國東北溫帶的針葉樹而 *D. taiwaniana* 發現於台灣亞熱帶低海拔地區的闊葉樹。本文並提供已知 *Dentipellis* 六種的檢索表。*Peniophora subsalmonea* 與 *P. formosana* 的形態特徵最相似，然而前者是一熱帶種，發現於印度洋的聯合島；而 *P. formosana* 發現於台灣的溫帶高山區。其次，*P. subsalmonea* 的燈籠狀囊狀體 (lamprocystidia) 較 *P. formosana* 者短且寬。再者，*P. subsalmonea* 的黏質囊狀體 (gloeocystidia) 為明顯厚壁（除先端為薄壁），先端有時呈尖形；*P. formosana* 的黏質囊狀體為略厚壁，先端鈍形。*P. subsalmonea* 的擔孢子也較 *P. formosana* 者略小。*Phanerochaete granulata* 主要識別特徵是具有顆粒狀子實層表面、無囊狀體以及小型的擔孢子。

關鍵詞：擔子菌門；皮殼菌科；刺皮菌屬；新種；筍殼菌屬；顯絲菌屬；臺灣；分類學。