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Acrodictys micheliae and *Dictyosporium manglietiae*, two new anamorphic fungi from woody litter of Magnoliaceae in northern Thailand

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Abstract – *Acrodictys micheliae* sp. nov. and *Dictyosporium manglietiae* sp. nov. are described from dead woody litter of *Michelia baillonii* and *Manglietia garrettii*, respectively, collected in Doi Suthep-Pui National Park, Thailand. The new fungi are distinctive and readily separated from those already described in the two genera. *Acrodictys micheliae* has cylindric-ovoid conidia that are similar in shape to *A. septosporioides* but smaller in size. *Dictyosporium manglietiae* is distinct from other species in that the conidia have a hyaline, fusoid to cylindrical appendage produced from the basal cell of the outer row of cells. The new taxa are described and illustrated, and compared with similar species.

lignicolous fungi / anamorphic fungi / new species / saprobes / systematics / taxonomy

INTRODUCTION

Recent fungal biodiversity studies in Thailand have resulted in descriptions of new fungal taxa from various habitats (e.g., banana: Photita *et al.*, 2002; 2003a; b; Magnoliaceae: Phromputtha *et al.*, 2003; 2004a; b; c; palm: Pinnoi *et al.*, 2003a; b; 2004; Pinruan *et al.*, 2002; 2004a; b; c; *Pandanus*: Thongkantha *et al.*, 2003; Zingiberaceae: Bussaban *et al.*, 2001; 2003a; b; 2004). In Thailand there have been several studies focused on fungal communities on wood including freshwater lignicolous microfungi (Sivichai *et al.*, 1998a; b; 2002; Sivichai, 1999; Sivichai & Hywel-Jones, 1999) and terrestrial lignicolous microfungi (e.g., Sihanonth *et al.*, 1998; Chatanon, 2001; Inderbitzin *et al.*, 2001; Inderbitzin & Berbee, 2001; Somrithipol & Jones, 2005). We are studying the biodiversity of fungi on magnoliaceous plants (e.g. Phromputtha *et al.*, 2003; 2004a; b; c; 2005). During examination of terrestrial fungi occurring on Magnoliaceae wood in Doi Suthep-Pui National Park, Thailand, we collected two new species; *Acrodictys micheliae*, from woody litter of *Michelia baillonii* (Pierre) Finet & Gagnep., and *Dictyosporium manglietiae* from *Manglietia garrettii* Craib. The new taxa are described and illustrated with interference light micrographs. Morphological characters of the new fungi are compared with similar species in two synoptic tables.

MATERIALS AND METHODS

Decaying woody litter of *Manglietia garrettii* (montha-doi or montha-daeng) and *Michelia baillonii* (cham-pee-pa) were collected from Doi Suthep-Pui National Park, Chiang Mai, northern Thailand during the dry season between January and June 2005. Samples were returned to the laboratory in individual plastic bags. High humidity was maintained by the addition of a paper towel moistened with sterile distilled water. Samples were incubated under ambient laboratory conditions (25-28 °C, fluctuating daylight and fluorescent light) and samples were examined microscopically for the presence of microfungi after 4-5 days and periodically for up to one month. Cultures of fungi were obtained where possible from single spore isolation (Choi *et al.*, 1999). Herbarium specimens and living cultures were deposited in PDD, Landcare Research, New Zealand and CMU Herbarium, Chiang Mai University, Thailand.

TAXONOMY

***Acrodictys micheliae* R. Kodsueb et McKenzie,** sp. nov. Figs 1-5

Coloniae in substrato naturali effusae. Mycelium cylindricae, septatis, laevibus, pallide brunneis vel brunneis, 3-4 µm lata. Stromae nullae. Hyphopodiae absentis. Setae nullae. Conidiophora solitaria, erecta, macronematosa, mononematosa, simplicia, recta vel flexuosa, non ramosis, apicem versus pallidiora, (3-) 4-5 septata, laevia, brunneae, usque ad 90 µm longa, 5.5-6.5 µm lata. Cellulae conidiogenae in conidiophoris incorporatae, monoblasticae, terminales, interdum percurrentes, cylindricae. Conidia (33-) 55-65 (-83) µm × (14.5-) 16.5 (-25.5) µm, solitaria, terminales, cylindricae-ovoidae, pallide brunnea vel brunnea, 9-11 transverse septata, 25-30 longitudinales septata, ad septa modice constricti.

Etymology: *micheliae*, the species epithet is derived from name of the host genus *Michelia*.

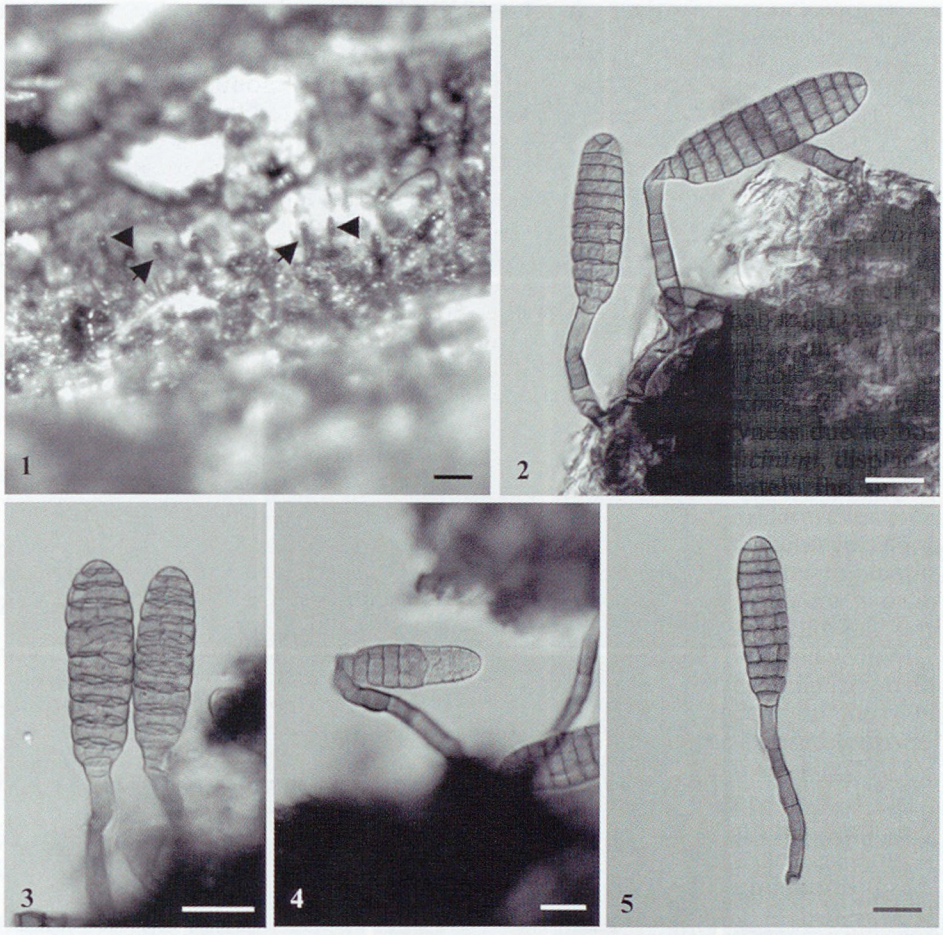
Colonies effuse, consisting of individual brown conidiophores scattered over the substrate surface. Mycelium cylindrical, septate, smooth, pale brown to brown, 3-4 µm thick. Stroma none. Hyphopodia absent. Setae none. Conidiophores arising singly, erect, macronematous, mononematous, simple, straight or slightly flexuous, unbranched, (3-) 4-5 septate, smooth, brown at the base, fading to pale brown towards the apex, up to 90 µm long, 5.5-6.5 µm wide. Conidiogenous cells integrated, monoblastic, terminal, sometines percurrent, cylindrical. Conidia (33-) 55-65 (-83) µm long, (14.5-) 16.5 (-25.5) µm wide ($\bar{x}$ = 60.7 × 18.3 µm, n = 15), solitary, terminal, cylindric-ovoid, pale brown to brown, smooth, with 9-11 transverse and 25-30 longitudinal septa, often slightly constricted at the septa.

Habitat: Saprobic on dead woody litter of *Michelia baillonii* (Pierre) Finet & Gagnep.

Distribution: THAILAND.

Teleomorph: Unknown.

Holotype: Thailand, Doi Suthep-Pui National Park, Chiang Mai, on dead woody litter of *Michelia baillonii*, 9 Jan. 2005, R. Kodsueb and I. Promputtha, PDD 88074. Living culture ICMP 16469.

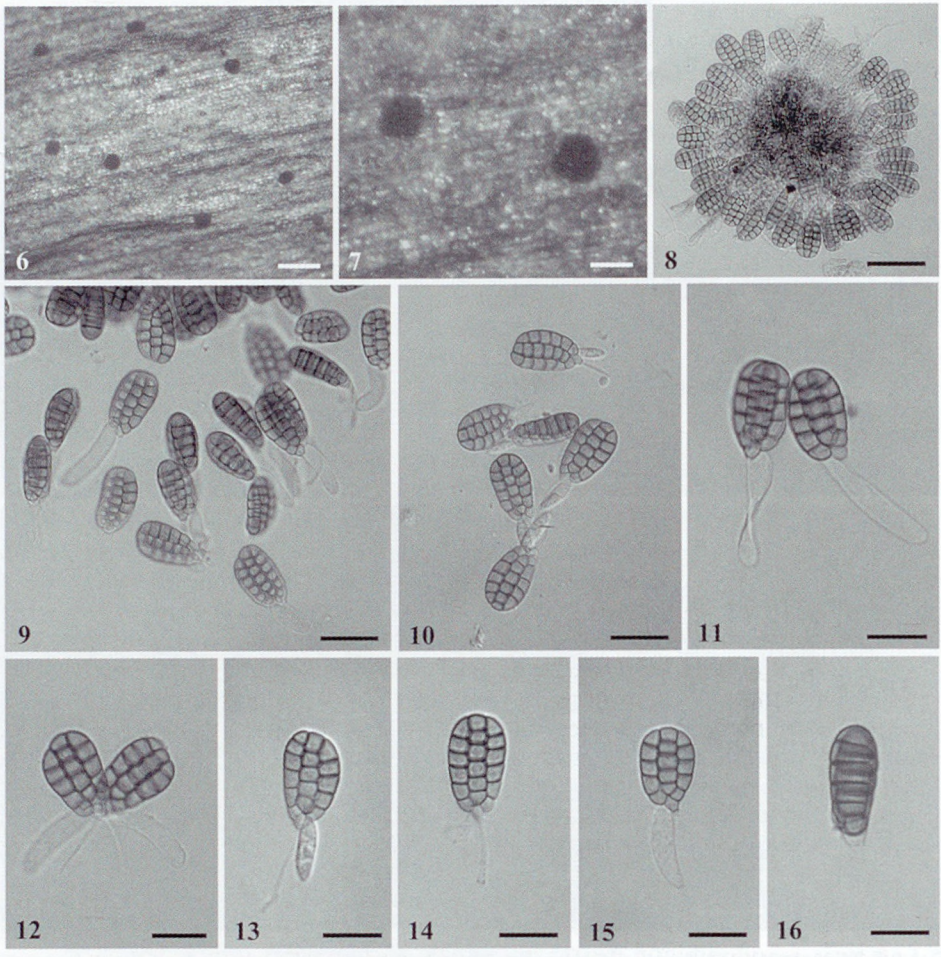


Figs 1-5. Micrographs of *Acrodictys micheliae* (from holotype). 1: Fungus on host tissue (arrowed head). 2-5: Conidia and conidiophores. Scale bars: 1 = 100 µm; 2 = 20 µm; 3 = 25 µm; 4-5 = 15 µm.

Colonies on potato dextrose agar dark green to black, 1 cm diam in 2 weeks at room temperature (~28 °C). Mycelium mostly immersed, aerial mycelium velvety to fluffy, no pigment diffusing into agar, not sporulating.

Dictyosporium manglietiae **R. Kodsueb et McKenzie,** sp. nov. Figs 6-16

Sporodochia in substrato naturali compactia, atro-brunnea vel nigra, usque ad ca 200 µm diam. Mycelium plerumque in substrato immersum, ex hyphis ramosis, septatis, subhyalinis vel dilutum brunneae, laevibus compositum. Conidiophora micronemata, mononemata, laevia, dilutum brunneae. Cellulae conidiogenae in conidiophoris incorporatae, terminales, determinatae, filiformes, hyalinae. Conidia 22-28 × 12.5-18 µm, complanata, acrogena, cheiroidea, solitaria, laevibus, brunnea, in conspectis ventralibus obovoidea, in conspectis lateralibus cylindricae, muriformia, ad septa modice constricti, in 16-19 cellulis, 3-serielibus composita.



Figs 6-16. Micrographs of *Dictyosporium manglietiae* (from holotype). 6-7: Conidiomata on host tissue. 8: Conidia and conidiophores (compact sporodochium). 9-16: Conidia. Scale bars: 6 = 500 µm, 7 = 200 µm, 8 = 50 µm, 9-10 = 25 µm, 11-15 = 15 µm, 16 = 10 µm.

Cellula basalis exteriorum serietum cum appendicibus tenuitunicatis, hyalinis, prime fusoidea, posteaescens cylindraceae, null septatum, 12-32 × 3.5-7.5 µm. Conidiorum secessio rhexolytica.

Etymology: *manglietiae*, the species epithet is derived from name of the host genus *Manglietia*.

Sporodochia on natural substrate compact, dark brown to black, up to *ca* 200 µm diam. Mycelium mostly immersed in substratum, composed of branched, septate, subhyaline to pale brown, smooth hyphae. Conidiophores micronematous, mononematous, smooth, pale brown. Conidiogenous cells integrated, terminal, determinate, filiform, hyaline. Conidia 22-28 × 12.5-18 µm ($\bar{x}$ = 24.9 × 14.7 µm, n = 35), complanate, acrogenous, cheiroid, solitary, smooth-walled, brown, obovoid in ventral view, cylindrical in lateral view, muriform, slightly constricted at the septa; consisting of 16-19 cells arranged in 3 rows. The basal cell

Table 1. Comparison between *Acrodictys micheliae* (this paper), *A. dennisii* (Ellis 1961), *A. erecta* (Ellis 1961) and *A. septosporioides* (Matsushima 1983).

	A. dennisii M.B. Ellis	*A. erecta* (Ellis & Everh.) M.B. Ellis	*A. micheliae* (this paper)	*A. septosporioides* Matsush.
Conidiophores	28-70 × 4-7 µm	17-80 × 4-7 µm	up to 90 × 5.5-6.5 µm	50-100 × 6-9 µm
Shape of conidia	Pyriform or clavate	Ovoid	Cylindric-ovoid	Cylindric-ellipsoid
Size of conidia	26-57 × 19-30 µm	24-40 × 15-22 µm	(33–) 55-65 (–83) × (14.75–) 16.5 (–25.5) µm	64-105 × 24-40 µm
No. of septa in conidia	numerous transverse and longitudinal septa	numerous transverse and longitudinal septa	9-11 transverse septa, 25-30 longitudinal septa	(7–) 10-11 transverse septa, 20-36 longitudinal septa
Host	Bamboo	*Arundo* and maize	*Michelia baillonii*	Dead wood

of one outer row of conidia provided with a thin-walled, hyaline, non-septate appendage, initially fusoid, later becoming cylindrical, measuring 12-32 × 3.5-7.5 µm ($\bar{x}$ = 21.3 × 5.8 µm, n = 33). Conidial secession rhexolytic.

Habitat: Saprobic on woody litter of *Manglietia garrettii* Craib.

Distribution: THAILAND.

Teleomorph: Unknown.

Holotype: Thailand, Doi Suthep-Pui National Park, Chiang Mai, on dead woody litter of *Manglietia garrettii*, 4 June 2005, R. Kodsueb and I. Promputtha, PDD 88075.

Isotype: Thailand, Doi Suthep-Pui National Park, Chiang Mai, on dead woody litter of *Manglietia garrettii*, 4 June 2005, R. Kodsueb and I. Promputtha, CMU25826.

Colonies on potato dextrose agar creamy to pale yellow, 1 cm diam in 1 week at room temperature (~28 °C). Mycelium partly immersed, aerial mycelium velvety to fluffy, no pigment diffusing into agar, not sporulating.

DISCUSSION

The genus *Acrodictys*, established by Ellis (1961), is characterised by brown conidia with several longitudinal and transverse septa, borne on the ends of erect brown conidiophores. The conidiophores often proliferate percurrently throught the apex. Baker *et al.* (2002) considered the genus to be heterogenous, and while separating four species into a new genus, *Junewangia*, suggested that the genus *Acrodictys* still requires refining. Sutton (1969) and Ellis (1961, 1971, 1976) have produced keys to species of *Acrodictys*. The cylindric-ovoid conidia of *A. micheliae* are morphologically most similar to the conidia of *A. septosporioides* Matsush. However, the conidia of *A. septosporioides* are larger (64-105 × 24-40 µm vs. (33-) 55-65 (-83) × (14.5-) 16.5 (-25.5) µm), and the conidiophores of *A. septosporioides* are also wider than those of *A. micheliae* (6-9 µm vs. 5.5-6.5 µm). A synopsis of characters of *A. micheliae*, *A. septosporioides* and two other species with similar, large conidia is given in Table 1.

Table 2. Comparison between conidia of *Dictyosporium manglietiae* (this paper) and similar species that possess appendages.

Characters	*D. alatum* Emden	*D. bulbosum* Tzean & J.L. Chen	*D. digitatum* J.L. Chen, C.H. Hwang & Tzean	*D. gauntii* Bhat & B. Sutton	*D. manglietiae* (this paper)	*D. musae* (Photita)	*D. nigroapice* Goh, W.H. Ho & K.D. Hyde	*D. palmae* Pinruan	*D. tetraseriale* Goh, Yanna & K.D. Hyde
Conidia									
No. of rows of cells	5	5(–6)	6-8	4-6	3	7	4	4	4
Complanate	+	+	+	–	+	–	+	+	+
Size	(22–) 26-35 × 15-24 µm	27-46 × (11–) 24-30 µm	46.5-74 (–88) × 26-46 µm	40-50 × 18-25 µm	22-28 × 12.5-18 µm	45-65 × 20-27 µm,	28-41 × 15-20 µm,	36-45 × 16-21 µm	24-40 × 14-20 µm
Appendages									
Position	Apex of outer rows of cells	Apical cells of the outer rows	Apical cell of rows	Base	Basal cells of outer rows	Central cells of outer rows	Apex of each outer row	Apical cell of rows	Apex of each outer row
Shape	Cylindrical or clavate	Globose to obovoid	Curved or straight appendages	Bulbose	Fusoid to long cylindrical	Clavate to obovoid	Cylindrical	Allantoid to clavate	Clavate
Size	20-25 × 5 µm	11-28 × 10-19 µm	*ca* 5-20 × 5 µm	10-17 × 8-13 µm (conidiogenous cell)	12-32 × 3.5-7.5 µm	12-28 × 3-9 µm	22-34 × 4-5 µm	12.2-15 × 1.2 µm	24-35 × 3-8 µm
Number per conidia	2	2	6-8	1	1	1-3	2	4	2

Dictyosporium Corda (1836) was established to accommodate sporodochial hyphomycetes with compact or rarely effuse colonies, cheiroid conidia, and micronematous conidiophores. Molecular work has shown that the "*Dictyosporium*" lineage of anamorphic fungi producing cheiroid conidia are closely related to one another and they form a strong monophyletic group in the *Pleosporales* (Tsui *et al.*, 2006). The genus was revised by Goh *et al.* (1999). Cai *et al.* (2003) reported two new species of *Dictyosporium* and produced a dichotomous key to accepted species. *D. manglietiae* is distinct in having conidia that comprise 3 rows of cells and a cylindrical appendage produced from the base. Two other species, *D. triseriale* Matsush. and *D. lakefuxianensis* L. Cai, K.D. Hyde & Mc Kenzie have complanate conidia of similar shape, and comprising 3 rows of cells, but they lack an appendage and differ slightly in conidial size (26-32 × 16-18 µm for *D. triseriale* and 15-22.5 × 10-16.5 µm for *D. lakefuxianensis*).

There are eight other species of *Dictyosporium* with appendiculate conidia (Table 2). Of these only *D. guantii* Bhat & B. Sutton and *D. musae* Photita have conidia that are not complanate. The other six, (*D. alatum* Emden, *D. bulbosum* Tzean & J.L. Chen, *D. digitatum* J.L. Chen, C.H. Hwang & Tzean, *D. nigroapice* Goh, W.H. Ho & K.D. Hyde, *D. palmae* Pinruan (nom. ined.), *D. tetraseriale* Goh, Yanna & K.D. Hyde) and *D. manglietiae* have flattened, complanate conidia. *D. manglietiae* differs from these species in appearance of the conidia (size, shape and number of cells/rows) and also differs in shape and position of appendages (Table 2). In most species the appendages are produced from the apical cell of the outer rows of cells (i.e., *D. alatum*, *D. bulbosum*, *D. nigroapice*, *D. tetraseriale*). Conidia of *D. digitatum* have a small terminal appendage on each row of cells (Goh *et al.*, 1999), as does *D. palmae* which possess an allantoid to clavate appendage on the apex of each row of cells (Pinruan *et al.*, pers. com.). In *D. musae* the conidial appendages arise from the central cells of the outer rows (Photita *et al.*, 2002). *D. gauntii* has what is regarded as a hyaline, bulbose conidiogenous cell attached to the basal cell of the conidia after conidial secession (Bhat & Sutton, 1985; Goh *et al.*, 1999). In *D. manglietiae* the appendage arises from the basal cell of an outer conidial row. *D. manglietiae* also differs from *D. gauntii* in having 3 rows of cells (vs. 4-6 rows in *D. gauntii*) and it has smaller conidia (22-28 × 12.5-18 µm vs. 40-50 × 18-25 µm).

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