

New anamorphic fungi from decaying woody litter of *Michelia baillonii* (Magnoliaceae) in northern Thailand

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Abstract – *Catenosynnema micheliae* gen. et sp. nov. and *Oedemium micheliae* sp. nov. are described from dead woody litter of *Michelia baillonii* (Magnoliaceae) collected from Doi Suthep–Pui National Park, Thailand. The novel anamorphic genus, *Catenosynnema* is characterised by synnematus conidiophores and subhyaline to pale brown, catenate conidia. The genus is similar to the anamorphic genera *Seifertia* and *Sorocybe*, both of which have catenate conidia, but differs in that its synnemata are paler in colour and of a different form. The second anamorphic taxon, *Oedemium micheliae* sp. nov. is distinct from other species in the genus in having conidia in short chains and possessing secondary conidiogenous ampullae. The new taxa are described, illustrated and compared with morphologically similar anamorphic fungi.

anamorphic fungi / *Catenosynnema micheliae* gen. and sp. nov. / lignicolous fungi / morphology / *Oedemium micheliae* sp. nov. / systematics, taxonomy

INTRODUCTION

Fungal diversity assessments have been carried out worldwide on various plant substrata, e.g. palms, grasses, leaf litter, wood and submerged wood (e.g. Lee *et al.*, 2005; Vasilyeva & Stephenson, 2005; 2006; Van Ryckegem & Verbeken, 2005a; 2005b; Hidayat *et al.*, 2006; Vijaykrishna & Hyde, 2006). It is believed that the high amount of litter generated in tropical rain forests may support a rich fungal diversity (Hyde, 1997). Recent studies of fungal diversity in Thailand have resulted in a number of new fungal taxa being described from several habitats (banana: Photita *et al.*, 2002; 2003a; b; dead leaves of a climber: Somrithipol and Jones, 2005; Magnoliaceae: Kodsueb *et al.*, 2006; Promputtha *et al.*, 2003; 2004a; b;

2005; palms: Pinnoi *et al.*, 2003a; b; 2004; 2006; Pinruan *et al.*, 2002; 2004a; b; c; *Pandanus*: Thongkantha *et al.*, 2003; Zingiberaceae: Bussaban *et al.*, 2001; 2003a; b; 2004). During our study on the diversity of saprobic fungi on woody litter of *Michelia baillonii* (Pierre) Finet & Gagnep (Magnoliaceae) in a tropical rain forest within Doi Suthep-Pui National Park, Thailand, we collected two novel anamorphic fungi, *Catenosynnema micheliae* gen. et sp. nov. and *Oedemium micheliae* sp. nov. The new taxa are described, illustrated and compared with morphologically similar fungi.

MATERIALS AND METHODS

Decaying woody litter of *Michelia baillonii* (Thai: *cham-pee-pa*) was collected from Doi Suthep-Pui National Park, Chiang Mai, Thailand during the dry season between January and May 2005. The samples were kept in individual plastic bags with the addition of a paper towel moistened with sterile distilled water to maintain high humidity. The samples were incubated under ambient laboratory conditions (25-28°C, 12/12h alternating daylight and black UV light) and examined microscopically for the presence of microfungi after 4-5 days and periodically for up to one month. Herbarium specimens were prepared and deposited in PDD (Landcare Research, New Zealand).

TAXONOMY

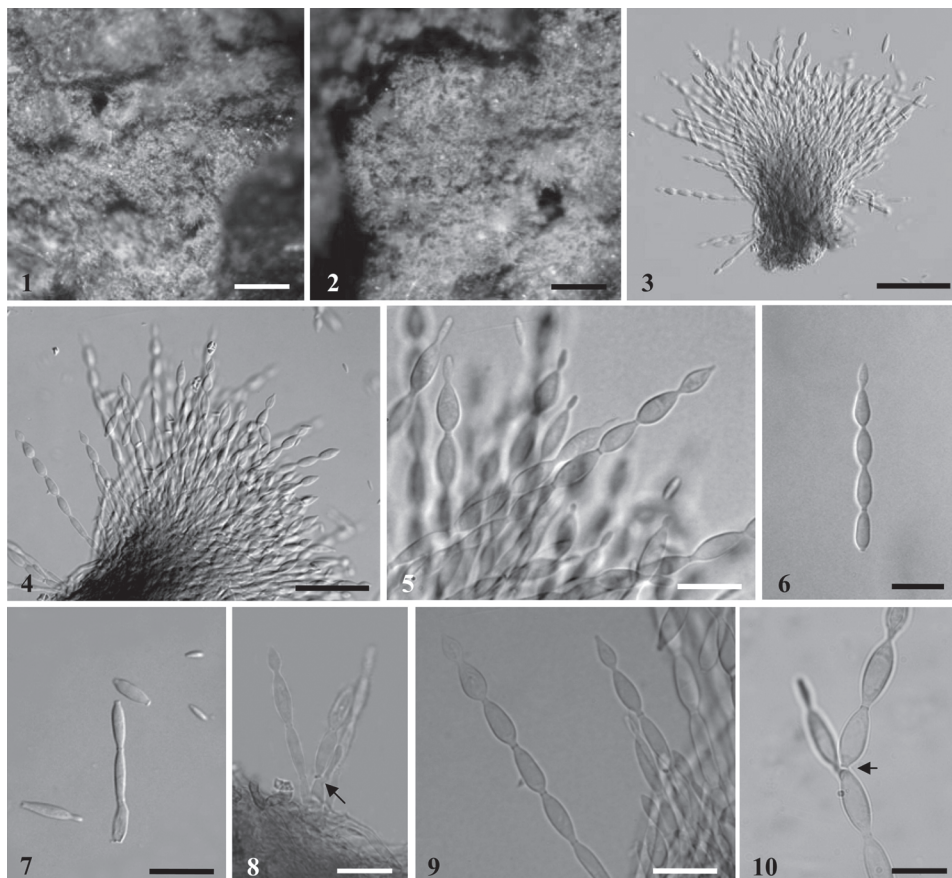
***Catenosynnema* R. Kodsueb, K.D. Hyde et W.H. Ho, gen. nov. Figs 1-10.**

Coloniae in substrato naturali effusae, aurantiacus-brunnea. Mycelium plerumque in substrato superficialis ad subimmersum, ex hyphis ramosis, septatis, brunnea, laevibus compositum. Stromae nullae. Hyphopodiae absentis. Setae nullae. Conidiophora macronematosa, synnematosum, strictum, rigidum, erecta, plerumque simplicibus, interdum distalis ramosum, cylindricae, septata, laevibus, pallide brunnea. Cellulae conidiogenae blasticae, integrum. Conidia acropleurogenosa, holoblasticae, plerumque simplicibus acropetalis catenae, interdum ramosum, sicca, unicellularis, laevibus, fusiformis vel ellipsoideum, subhyalinum vel pallide brunnea. Conidiorum secessio schizolytica.

Colonies effuse, golden-brown. *Mycelium* mostly superficial, partly immersed, composed of branched, septate, smooth, brown hyphae. *Stroma* none. *Hyphopodia* absent. *Setae* none. *Conidiophores* macronematous, predominantly synnematosum and arranged as tight, stiff synnemata, erect, mostly simple, sometimes branched distally, cylindrical, septate, smooth, pale brown. *Conidiogenous cells* blastic, integrated. *Conidia* acropleurogenous, holoblastic, mostly in simple acropetal chains, sometimes branched, dry, unicellular, smooth, fusiform to ellipsoid, subhyaline to pale brown. *Conidial secession* schizolytic.

Etymology: *Catenosynnema*, referring to the synnematosum fungus producing chains of conidia on the apex of synnemata.

Type species: *Catenosynnema micheliae* R. Kodsueb, K.D. Hyde et W.H. Ho, gen. et sp. nov.



Figs 1-10. Micrographs of *Catenosynnema micheliae* (from holotype). 1-2. Fungi on host tissue. 3. An entire synnema. 4-5. Conidia and conidiophores. 6-10. Catenate conidia. Note: branched conidial chains in Figs. 8 and 10 (arrows). Scale bars: 1 = 500 µm, 2 = 350 µm, 3 = 75 µm, 4 = 50 µm, 5, 7-9 = 15 µm, 6 = 20 µm, 10 = 10 µm.

***Catenosynnema micheliae* R. Kodsueb, K.D. Hyde et W.H. Ho, sp. nov. Figs 1-10.**

Synnemata in substrato naturali effusae, aurantiacus-brunnea, usque ad 215 µm longa. Mycelium plerumque in substrato superficialis ad subimmersum, ex hyphis ramosis, septatis, brunnea, laevibus compositum. Stromae nullae. Hyphopodiae absentis. Setae nullae. Conidiophora macronematosa, synnematosae, strictum, rigidum, erecta, distalis ramosum, cylindrica, septata, laevibus, pallide brunnea. Cellulae conidiogenae blasticae, integrum. Conidia (9.5-)13-15(-19.5) × (3-)4.5-5(-6) µm, acropleurogenosa, holoblasticae, plerumque simplicibus acropetalis catenae, interdum ramosum, disjunctus apud angustus interconidial isthmi, sicca, unicellularis, laevibus, fusiformis vel ellipsoideum coeptus, obpyriformis cum maturus, subhyalinum vel pallide brunnea. Conidiorum secessio schizolytica.

Etymology: *micheliae*, derived from host genus, *Michelia*.

Synnemata effuse, golden-brown, up to 215 µm long. *Mycelium* mostly superficial, partly immersed, composed of branched, septate, smooth, brown hyphae. *Stroma* none. *Hyphopodia* absent. *Setae* none. *Conidiophores* macronematous, predominantly synnematosus and arranged as tight, stiff synnemata, erect, more or less straight, branched distally, cylindrical, septate, smooth, pale brown. *Conidiogenous cells* blastic, integrated. *Conidia* (9.5-)13-15(-19.5) × (3-)4.5-5(-6) µm ($\bar{x}$ = 13.9 × 4.7 µm, n = 30), acropleurogenous, holoblastic, mostly in simple acropetal chains, sometimes branched, separated by distinctive, narrow, interconidial isthmi, dry, unicellular, smooth, fusiform to ellipsoid initially, obpyriform at maturity, subhyaline to pale brown. *Conidial secession* schizolytic.

Habitat: Saprobic on dead woody litter of *Michelia baillonii*.

Distribution: THAILAND.

Teleomorph: Unknown.

Holotype: THAILAND, Doi Suthep-Pui National Park, Chiang Mai, on dead woody litter of *Michelia baillonii*, 18 Apr. 2005, R. Kodsueb and I. Promputtha, PDD 87914.

***Oedemium micheliae* R. Kodsueb, K.D. Hyde et McKenzie**, sp. nov. Figs 11-25.

Coloniae in substrato naturali atrobrunnea vel nigra. Mycelium in substrato subimmersum et superficialis, ex hyphis 8.5–12.5 µm crassa, brunnea vel atro-brunnea. Stromae nullae. Hyphopodiae absentis. Setae nullae. Conidiophora usque ad 275 µm longa, (7.5-)8.5-10(-15) µm lata, macronematosa, mononematosa, ramosum, erecta, flexuosa, distincte nodum cum terminales et intercalaris conidiogenae ampulliformis (21.5-)25-28(-37) × (14.5-)20-22(-29.5) µm ($\bar{x}$ = 26.6 × 20.2 µm, n = 20), laevibus, brunnea. Cellulae conidiogenae in conidiophoris incorporatae, polyblasticae, terminales et intercalaris, globosae, subglobosae vel pyriformae, hilum parvum. Conidia (21-)30.5-35(-43) × (9.5-)11.5-13(-16.5) µm, solitaria vel catenatum, sicca, acrogenum vel acropleurogenum, simplicibus, ellipsoidum, oblonga rotundatum ad demum vel dumb-bell figuratum, cum inconspicuus terminale cicatricis-aliquando protudere, (0-)1(-2)-septata, laevibus, pallide brunnea vel atrobrunnea.

Etymology: *micheliae*, derived from host genus, *Michelia*.

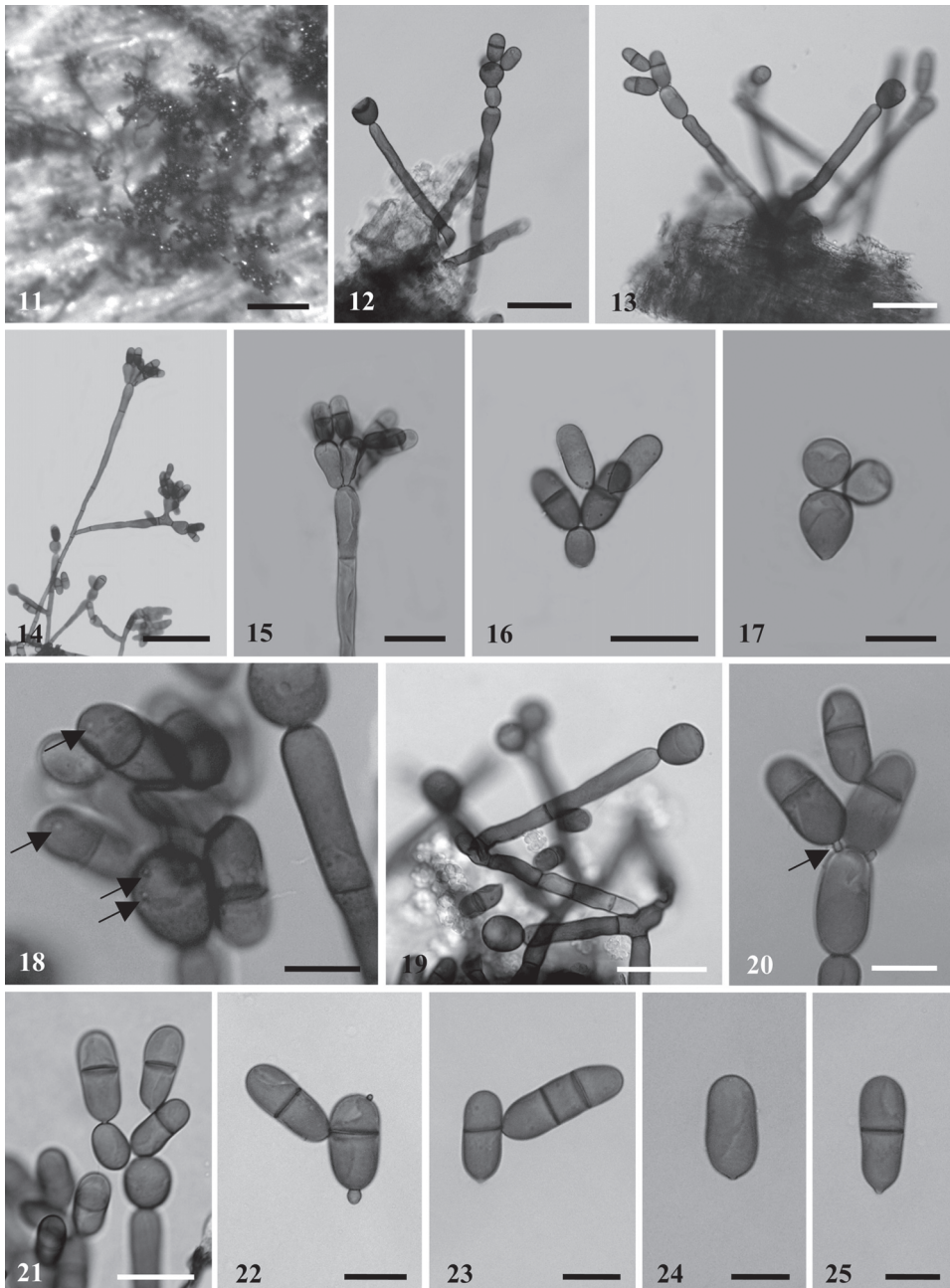
Colonies on natural substratum very dark brown to black. *Mycelium* partly immersed, partly superficial; hyphae 8.5-12.5 µm thick, brown or dark brown. *Stroma* none. *Setae* none. *Hyphopodia* absent. *Conidiophores* up to 275 µm long, (7.5-)8.5-10(-15) µm wide, macronematous, mononematous, branched, erect, flexuous, distinctly nodose with terminal and intercalary ampulliform conidiogenous loci (21.5-)25-28(-37) × (14.5-)20-22(-29.5) µm ($\bar{x}$ = 26.6 × 20.2 µm, n = 20), smooth, mid brown. *Conidiogenous cells* polyblastic, integrated, terminal becoming intercalary, spherical, subspherical or pyriform, with small pores. *Conidia* (21-)30.5-35(-43) × (9.5-)11.5-13(-16.5) µm ($\bar{x}$ = 30.7 × 12.5 µm, n = 30), solitary or catenate, dry, acrogenous or acropleurogenous, simple, ellipsoidal, oblong or dumb-bell shaped, rounded at the ends, with inconspicuous terminal scars which occasionally protrude, (0-)1(-2)-septate, smooth, pale to dark brown.

Habitat: Saprobic on woody litter of *Michelia baillonii*.

Distribution: THAILAND.

Teleomorph: Unknown.

Holotype: THAILAND, Doi Suthep-Pui National Park, Chiang Mai, on dead woody litter of *Michelia baillonii*, 19 Apr. 2005, R. Kodsueb and I. Promputtha, PDD 87913.



Figs 11-25. Micrographs of *Oedemium micheliae* (from holotype). 11. Conidiomata on host tissue. 12-15, 18-21. Conidia and conidiophores. 16-17, 22-25. Conidia. Note: pores on conidia and conidiogenous ampulle in Fig. 18 (arrows), the protuberant hilum of the conidium in Fig. 20 (arrow). Scale bars: 11 = 300 μ m, 12-13, 19 = 50 μ m, 14 = 75 μ m, 15-17, 21 = 25 μ m, 18 = 20 μ m, 20, 22-25 = 15 μ m.

DISCUSSION

Catenosynnema gen. nov. is similar to the genera *Seifertia* and *Sorocybe*, both of which produce holoblastic conidia in branched chains (Partridge & Morgan-Jones, 2002). However, in their gross morphology *Seifertia* and *Sorocybe* have a markedly different appearance from *Catenosynnema*. Their synnemata are long, capitate and composed of dark, macronematous conidiophores, whereas the synnemata of *Catenosynnema* are short, cylindrical, and golden brown with macronematous conidiophores. The conidia of *Seifertia* and *Sorocybe* are darker coloured than those of *Catenosynnema*, and the conidial chains are commonly branched. In *Catenosynnema* the conidia are pale coloured and the conidial chains are only occasionally branched. The individual conidia of *Catenosynnema* are separated by distinctive, narrow, interconidial isthmi.

The genus *Oedemium* was established by Link in 1824 for *O. atrum* as the type species (Hughes & Hennebert, 1963). The genus is characterised by brown conidia with one or more septa, borne on polyblastic conidiogenous ampullae. There are 13 reported species in *Oedemium* (Indexfungorum, 2007), but *O. atrum* Link has been synonymised with *O. didymum* (J.C. Schmidt) S. Hughes (Hughes & Hennebert, 1963). *Chaetosphaerella fusca* (Fuckel) E. Müll. & C. Booth and *C. phaeostroma* (Durieu & Mont.) E. Müll. & C. Booth have been reported as the teleomorphs of *O. didymum* and *O. minus* (Link) S. Hughes, respectively (Müller & Booth, 1972). *Oedemium robustum* was reported to be the anamorph of *Acrogenotheca elegans* (Fraser) Ciferri and Batista (Hughes, 1967), however the species has not yet been transferred to *Acrogenotheca* (based on Indexfungorum webpage). A synopsis of characters of *O. micheliae* and thirteen other species within the genus is given in Table 1. The new species differs from other species within the genus in having secondary conidiogenous ampullae.

Table 1. Comparison between *Oedemium micheliae* (this paper) and other species in the genus.

Species	Authority	Place of publication	Country	Host	Reference
<i>Oedemium agrostidis</i>	Unamuno (1933)	Rev. Acad. Cienc. Madrid 30: 55	Spain	Dry leaves of <i>Agrostis stolonifera</i>	Petrak's Lists 7: 948; Saccardo Syll. fung. 26: 1328
<i>Oedemium atrum</i> * Current name: <i>Chaetosphaerella fusca</i> (Fuckel) E. Müll. & C. Booth	Link (1824)	Linné Species Plantarum, Edn 4, 6: 42; Trans. Br. mycol. Soc. 58: 77	Germany, Switzerland, U.K., North America	Branches/bark of <i>Tilia</i> , leaves of <i>Bignonia</i>	Saccardo Syll. fung. 4: 297; 12: 471; 20: 209
<i>Oedemium badium</i>	Rabenh.	D. C. Fl. n. 980	Austria	Rotten trunk	Saccardo Syll. fung. 4: 298
<i>Oedemium didymium</i> * Current name: <i>Chaetosphaerella fusca</i> (Fuckel) E. Müll. & C. Booth	(J.C. Schmidt) S. Hughes (1958)	Myk. Heft. I, p. 81; Canad. J. Bot. 36: 790	Germany	Dry wood of <i>Virgaria nigra</i>	Index of Fungi 2: 514

Table 1. Comparison between *Oedemium micheliae* (this paper) and other species in the genus. (continued)

<i>Species</i>	<i>Authority</i>	<i>Place of publication</i>	<i>Country</i>	<i>Host</i>	<i>Reference</i>
<i>Oedemium fungicola</i>	Bat. & A.F. Vital (1956)	Publções Inst. Micol. Recife 33: 7	Brazil	On <i>Stromatopycnis rosetum</i> found on <i>Coccoloba paniculata</i>	Index of Fungi 2: 316
<i>Oedemium micheliae</i>	Kodsueb, K.D. Hyde & McKenzie (2007)	This paper	Thailand	Decaying <i>Michelia baillonii</i> wood	This paper
<i>Oedemium minus</i> * Current name: <i>Chaetosphaerella phaeostroma</i> (Fuckel) E. Müll. & C. Booth	(Link) S. Hughes (1958)	Canad. J. Bot. 36: 790	Germany	Decayed branches	Saccardo Syll. fung. 20: 426
<i>Oedemium ramorum</i>	Fr.	Syst. Myc. 3: 345	Carolina, U.S.A.	Living branch of <i>Quercus</i> and <i>Andromeda arborea</i>	Saccardo Syll. fung. 4: 299; 15: 230
<i>Oedemium robustum</i> * Current name: <i>Acrogenotheca elegans</i> (Fraser) Ciferri & Batista	Berk. (1855)	Fl. Nov. Zeal. p. 198	New Zealand	Bark of <i>Hedycarya</i> , <i>Corynocarpus</i>	Saccardo Syll. fung. 4: 297
<i>Oedemium sparsum</i>	Berk. & Broome	F. Ceyl. N. 903	Sri Lanka	On <i>Pandanus odoratissimus</i>	Saccardo Syll. fung. 4: 298
<i>Oedemium subsparsum</i>	Berk. & Ravenel	North Am. F. n. 622	Carolina, U.S.A.	Bark of <i>Platanus</i>	Saccardo Syll. fung. 4: 297
<i>Oedemium thalictri</i>	Japp (1905)	Ann. Mycol. 3: 401	Germany	Living leaves of <i>Thalictrum minus</i>	Saccardo Syll. fung. 22: 1354
<i>Oedemium tomentosum</i>	Corda (1837)	Ic. I, p. 17, f. 233	Czech Republic	Rotten <i>Fagus</i> wood	Saccardo Syll. fung. 4: 298
<i>Oedemium truncorum</i>	Fr.	Syst. Myc. 3: 345	Germany	Chopped disc of trunk	Saccardo Syll. fung. 4: 297

* Transferred to other genera.

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