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Two new entomogenous species of *Moelleriella* with perithecia in tubercles from Thailand

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ABSTRACT

Two new species of *Moelleriella* were discovered during diversity surveys of entomopathogenic fungi in the south of Thailand and are described as *M. alba* and *M. chumphonensis* based on morphological characters and molecular study. They have effuse white to orange stromata. Their teleomorphs are unique in producing a single perithecium inside a tubercle resembling *Moelleriella raciborskii*, a common species in Thailand. A combined matrix of nuclear large subunit rRNA gene (LSU) and RNA polymerase II subunit one (RPB1) gene shows that both species cluster in a distinct lineage as sister to *M. raciborskii*/"*Aschersonia*" *placenta*.

1. Introduction

The genus *Moelleriella* was erected by Bresadola in 1896 with *M. sulphurea* as type and now considered a synonym of *Moelleriella phyllogena* (Mont.) P. Chaverri & K.T. Hodge. This fungal genus was separated from *Hypocrella* Sacc. *s.l.* concurrently with *Samuelsia* P. Chaverri & K.T. Hodge (Chaverri et al. 2008) because its ascospores disarticulate inside the ascus whereas *Hypocrella* and *Samuelsia* ascospores are filiform or long fusiform that remain whole after discharge (non-disarticulate ascospores).

Chaverri et al. (2008) formally described the anamorph of *Moelleriella* and *Samuelsia* as aschersonia-like, while *Aschersonia sensu stricto* established by Montagne (1848) based on *Aschersonia taitensis* Mont., is the anamorph of *Hypocrella*. The anamorphs of *Moelleriella* and *Samuelsia* are similar to *Aschersonia s. str.*, characterized by shape, bright color of stromata that cover the hosts, conidiomata with phialides with or without paraphyses (Petch 1921; Mains 1959a,b). All species in these three genera and their anamorphs are pathogenic to scale insects (*Coccidae*) or whiteflies (*Aleyrodidae*) and commonly found in tropical and subtropical regions as described by Montagne (1848), Petch (1921), Mains (1959a,b), Chaverri et al. (2008), Mongkolsamrit et al. (2009, 2011a,b), Qiu et al. (2009, 2010), and Qiu and Guan (2010).

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At the last International Botanical Congress in Melbourne a unitary system of nomenclature, or One Fungus = One Name (1F = 1N) has been adopted for fungi no matter whether teleomorph-typified or anamorph-typified (McNeill et al. 2012). *Aschersonia* Mont. (1848) is a nomen conservandum with type *A. taitensis* and has the priority over the teleomorphic generic name *Hypocrella* Sacc. (1878), while *Moelleriella* and *Samuelsia* are being treated as distinct and valid genera due to the views on the prioritization of generic names. Thus *Aschersonia* (in the strict sense) only replaces all *Hypocrella* species.

We recently collected two unidentified specimens of *Moelleriella* from the forests in the south of Thailand. Their

Table 1 – Cultures and GenBank accession numbers of material used in this study.

Species	Specimen	Isolate	Origin	GenBank accession no.	
				LSU	RPB1
Related species					
Aschersonia calendulina	BBH 17325	BCC 20306	Thailand	GU552148	–
A. cf. discoidea	I93-901d	ARSEF 7663	Côte D'Ivoire	EU392567	EU392700
A. disciformis	P.C. 655	CUP 067861	Honduras	EU392560	EU392697
A. disciformis	P.C. 676	CUP 067840	Honduras	EU392566	EU392699
A. disciformis	P.C. 585	CUP 067832	Bolivia	EU392558	EU392696
A. hirsuta	P.C. 543	CUP 067841	Bolivia	EU392569	EU392702
A. hirsuta	P.C. 436.2	CUP 067848	Mexico	AY986922	DQ000350
A. luteola	BBH 14078	BCC 7865	Thailand	DQ384946	–
A. minutispora	BBH 12951	BCC 17487	Thailand	GU552151	–
A. viridans	P.C. 635	CUP 067850	Honduras	EU392572	EU392705
A. viridans	P.C. 670	CUP 067852	Honduras	EU392574	EU392706
A. viridans	P.C. 632	CUP 067849	Honduras	EU392571	EU392704
Moelleriella basicystis	P.C. 374	CUP 067745	Costa Rica	AY986903	DQ000329
M. cf. mollii[a]	BBH 33722	BCC 60924	Thailand	KF951146	–
M. cf. mollii	BBH 33722	BCC 60925	Thailand	KF951147	–
M. evansii	P.C. 627	CUP 067764	Ecuador	AY986916	DQ000343
M. libera	P.C. 445	CUP 067869	Mexico	AY986900	DQ000326
M. libera	P.C. 444	CUP 067868	Mexico	EU392591	EU392714
M. mollii	I93-901a	ARSEF 7660	Côte D'Ivoire	EU392599	EU392719
M. mollii	I93-901c	ARSEF 7667	Côte D'Ivoire	EU392600	EU392720
M. ochracea	P.C. 648	CUP 067779	Honduras	EU392605	EU392723
M. ochracea	IE 1308	P.C. 726	Mexico	EU392601	EU392721
M. phyllogena	J.B. 130	CUP 067793	Panama	EU392608	EU392724
M. raciborskii	Afr 28	ARSEF 7637	Ghana	DQ070113	EU392727
M. raciborskii	I93-901b	ARSEF 7661	Côte D'Ivoire	EU392611	EU392728
M. raciborskii	P.C. 533	–	Vietnam	AY986911	DQ000338
M. reineckiana	BBH 5117	BCC 1765	Thailand	–	DQ385010
M. reineckiana	BBH 5841	BCC 1713	Thailand	–	DQ385008
M. rhombispora	P.C. 467	CUP 067538	Costa Rica	AY986908	DQ000334
M. rhombispora	P.C. 696	CUP 067550	Honduras	EU392618	EU392732
M. sloaneae	I94-922c	CUP 067796	Belize	EU392622	EU392735
M. sloaneae	I94-920	CUP 067802	Guatemala	EU392621	EU392734
M. umbospora	P.C. 457	CUP 067816	Mexico	AY986904	DQ000330
M. umbospora	P.C. 461	CUP 067817	Mexico	EU392628	EU392740
M. zhongdongii	P.C. 504	CUP 067544	Costa Rica	EU392631	EU392741
M. zhongdongii	P.C. 549	CUP 067818	Bolivia	EU392632	EU392742
Samuelsia chalalensis	P.C. 560	CUP 067856	Bolivia	EU392637	EU392743
S. geonomis	P.C. 614	CUP 067857	Bolivia	EU392638	EU392744
S. mundiveteris[a]	BBH 22536	BCC 30560	Thailand	GU552156	–
S. mundiveteris	BBH 26961	BCC 40021	Thailand	GU552152	–
S. mundiveteris	BBH 26961	BCC 40022	Thailand	GU552153	–
Current study					
Moelleriella alba[a]	BBH 31089	BCC 49409	Thailand	JQ269646	JQ256906
M. alba	BBH 31089	BCC 49492	Thailand	JQ269645	JQ256905
M. chumphonensis[a]	BBH 30397	BCC 47574	Thailand	JQ269647	JQ256907
M. chumphonensis	BBH 30399	BCC 47575	Thailand	JQ269648	JQ256908
M. raciborskii[a]	BBH 31035	BCC 49361	Thailand	–	JQ269643
M. raciborskii	BBH 31035	BCC 48745	Thailand	–	JQ269642
M. raciborskii	BBH 30421	BCC 47597	Thailand	–	JQ269644
Outgroup					
Epichloë elymi		C. Schardl760	U.S.A.	AY986924	DQ000352
Balansia henningsiana		GAM16112	U.S.A.	AY489715	AY489643

[a] Living cultures isolated from ascospores.