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Three new species of *Aleurodiscus* s.l. (Russulales, Basidiomycota) on bamboos from East Asia

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Abstract – Three new species, *Aleurodiscus dextrinoideophyses*, *A. thailandicus* and *A. verrucosporus*, on bamboos are described and illustrated based on morphological and molecular evidence. *Aleurodiscus dextrinoideophyses* and *A. thailandicus*, collected from northern Thailand, possess abundant acanthophyses and small smooth basidiospores, and belong to the *A. cerussatus* group. While *A. dextrinoideophyses* is characterized by the dextrinoid acanthophyses, *A. thailandicus* has yellow acanthophyses arranged between subhymenium and basal layer. *Aleurodiscus verrucosporus*, collected from Fujian Province, southeastern China, is distinguished by the absence of acanthophyses and verrucose basidiospores. All the three species have abundant gloeocystidia and simple-septate generative hyphae. The phylogeny of taxa in Stereaceae was inferred from the combined ITS and nrLSU sequence data. In our phylogenetic analyses, *A. dextrinoideophyses* and *A. thailandicus* steadily nested within the *A. cerussatus* group, whereas *A. verrucosporus* clustered with different taxa in maximum parsimony and Bayesian analyses.

***Acanthophysellum* / Bambusicolous fungi / Stereaceae / Taxonomy**

INTRODUCTION

Aleurodiscus sensu Núñez & Ryvarden (1997) is a big genus in Russulales, and includes a large number of species with very different morphological characters, for example, acanthophyses present or absent, generative hyphae nodose-septate or simple-septate, basidiospores ornamented or smooth. So far, only a small part of the species were sequenced and subjected to phylogenetic analyses. In the phylogenetic trees, most species of *Aleurodiscus* s.l. nested within the Stereaceae clade in Russulales, except that two species of *Aleurocystidiellum* P.A. Lemke formed a distinct clade out of Stereaceae (Wu *et al.* 2001, Larsson & Larsson 2003, Miller *et al.* 2006). On the other hand, in the Stereaceae clade, only *Acanthobasidium* Oberw. was fully supported as a monophyletic genus, and several small morphologically separated genera of *Aleurodiscus* s.l. intermingled with taxa of *Stereum* Hill ex Pers., *Xylobolus* P. Karst. and *Gloeocystidiellum* s.l. (Wu *et al.* 2001, Larsson & Larsson 2003, Binder *et al.* 2005, Miller *et al.* 2006). Apparently, the phylogeny of *Aleurodiscus* s.l. are still far from resolved, and the recently described new species in this group were treated in a broad sense (Gorjón *et al.* 2013, Dai & He 2016).

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In 2016, many corticioid fungi of homobasidiomycetes on bamboos were collected in southern China and northern Thailand by the corresponding author. Morphological and molecular examinations showed that there was high species diversity of russuloid taxa among these bambusicolous fungi, such as *Aleurodiscus* s.l., *Asterostroma* Massee, and *Vararia* P. Karst. The present paper belongs to the series of studies of corticoid fungi on bamboos in East Asia. In the paper, three species of *Aleurodiscus* s.l., two from northern Thailand on woody bamboos and one from Fujian Province, southeastern China on herbaceous bamboo, are described and illustrated as new to science.

MATERIALS AND METHODS

Morphological studies – Voucher specimens are deposited in the herbaria of Beijing Forestry University, China (BJFC) and Mae Fah Luang University, Thailand (MFLU). Samples for microscopic examination were mounted in Melzer's reagent or 1% phloxine. The following abbreviations are used: L = mean spore length, W = mean spore width, Q = L/W ratio, n (a/b) = number of spores (a) measured from given number of specimens (b). Color codes and names are from Kornerup & Wanscher (1978).

DNA extraction and sequencing – A CTAB plant genome rapid extraction kit-DN14 (Aidlab Biotechnologies Co., Ltd) was employed for DNA extraction and PCR amplification from dried specimens. The ITS region was amplified with the primer pair ITS5 and ITS4 (White *et al.* 1990) using the following procedure: initial denaturation at 95°C for 4 min, followed by 34 cycles at 94°C for 40 s, 58°C for 45 s and 72°C for 1 min, and final extension at 72°C for 10 min. The nrLSU gene region was amplified with the primer pair LR0R and LR7 (http://www.biology.duke.edu/fungi/mycolab/primers.htm) using the following procedure: initial denaturation at 94°C for 1 min, followed by 34 cycles at 94°C for 30 s, 50°C for 1 min and 72°C for 1.5 min, and final extension at 72°C for 10 min. DNA sequencing was performed at Beijing Genomics Institute, and the sequences were deposited in GenBank (Table 1).

Phylogenetic analyses – The molecular phylogeny of Stereaceae was inferred from the combined dataset of ITS and nrLSU sequences. The sequences retrieved from open databases originated from Wu *et al.* (2001, 2010), Larsson & Larsson (2003) and Dai & He (2016) (Table 1). *Gloeodontia discolor* (Berk. & M.A. Curtis) Boidin and *G. pyramidata* (Berk. & M.A. Curtis) Hjortstam were selected as the outgroup taxa (Larsson & Larsson 2003). The sequences were aligned using the ClustalX 1.83 (Chenna *et al.* 2003). Alignments were optimized manually in BioEdit 7.0.5.3 (Hall 1999). Trees were figured in Treeview 1.6.6 (Page 1996).

Maximum parsimony analyses (MP) were performed using PAUP* 4.0b10 (Swofford 2002). Gaps in the alignments were treated as missing data. Trees were generated using 100 replicates of random stepwise addition of sequence and tree-bisection reconnection (TBR) branch-swapping algorithm with all characters given equal weight. Branch supports (BT) for all parsimony analyses were estimated by performing 1,000 bootstrap replicates (Felsenstein 1985) with a heuristic search of 10 random-addition replicates for each bootstrap replicate. The tree length (TL), consistency indices (CI), retention indices (RI), rescaled consistency indices (RC) and homoplasy index (HI) were calculated for each tree generated.

Table 1. Taxa with locality, substrate, and GenBank accession numbers for ITS and nrLSU sequences used in the phylogenetic analyses

Taxa	*Voucher*	*Locality*	*Substrate*	*ITS*	*nLSU*
Acanthobasidium bambusicola	He2357	China	bamboo	KU559343	KU574833
Acanthobasidium norvegicum	T623	France	*Rubus* sp.	–	AY039328
Acanthobasidium phragmitis	CBS233.86	France	*Phragmites australis*	–	AY039305
Acanthobasidium weirii	HHB12678	USA	*Picea stichensis*	–	AY039322
Acanthofungus rimosus	Wu9601-1	China: Taiwan	*Calocedrus formosana*	–	AY039333
Aleurodiscus abietis	T330	Canada	*Abies balsamea*	–	AY039324
Aleurodiscus amorphous	Ghobad-Nejhad2464	China	*Abies* sp.	KU559342	KU574832
Aleurodiscus amorphous	HHB15282	USA	*Picea glauca*	–	AY039312
Aleurodiscus aurantius	T621	France	–	–	AY039317
Aleurodiscus bisporus	T627	Guadeloupe	–	–	AY039318
Aleurodiscus bisporus	T614	Guadeloupe	–	–	AY039327
Aleurodiscus botryosus	He2712	China	angiosperm	KX306877	KY450788[a]
Aleurodiscus botryosus	Wu9302-61	China: Taiwan	angiosperm	–	AY039331
Aleurodiscus cerussatus	HHB11235	USA	*Abies balsameus*	–	AY039321
Aleurodiscus cerussatus	He2208	USA	angiosperm	KX306874	KY450785[a]
Aleurodiscus dextrinoideocerussatus	EL25-97	Spain	–	AF506401	AF506401
Aleurodiscus dextrinoideophyses	He4078	Thailand	bamboo	–	KY450783[a]
Aleurodiscus dextrinoideophyses	He4105	Thailand	bamboo	–	KY450784[a]
Aleurodiscus effusus	He2261	China	gymnosperm	KU559344	KU574834
Aleurodiscus grantii	HHB14417	USA	*Abies procera*	KU559363	KU574821
Aleurodiscus grantii	He2928	China	*Abies* sp.	KU559345	KU574835
Aleurodiscus lividocoeruleus	MB1825	USA	*Abies lasiocarpa*	–	AY039314
Aleurodiscus mesaverdensis	FP120155	USA	–	KU559359	KU574817
Aleurodiscus mirabilis	He3730	China	*Cinnamomum camphora*	KX306878	KY450789[a]
Aleurodiscus mirabilis	He3733	China	*Cinnamomum camphora*	KY450787[a]	KY450791[a]
Aleurodiscus oakesii	He2243	USA	*Quercus* sp.	KU559352	KU574840

Table 1. Taxa with locality, substrate, and GenBank accession numbers for ITS and nrLSU sequences used in the phylogenetic analyses *(continued)*

Taxa	*Voucher*	*Locality*	*Substrate*	*ITS*	*nLSU*
Aleurodiscus oakesii	HHB11890	USA	*Ostrya virginiana*	–	KU574823
Aleurodiscus penicillatus	T322	Canada	*Picea* sp.	–	AY039315
Aleurodiscus penicillatus	HHB13223	USA	*Picea sitchensis*	–	KU574816
Aleurodiscus thailandicus	He4099	Thailand	bamboo	KY450781[a]	KY450782[a]
Aleurodiscus verrucosporus	He4491	China	bamboo	KY450786[a]	KY450790[a]
Aleurodiscus wakefieldiae	FP135654	France	*Castanea* sp.	KU559369	KU574829
Aleurodiscus wakefieldiae	He2580	China	angiosperm	KU559353	KU574841
Boidinia macrospora	Wu9202-21	China: Taiwan	angiosperm	AF506377	AF506377
Conferticium heimii	CBS321.66	Central African Republic	–	AF506381	AF506381
Conferticium ravum	NH13291	Estonia	*Populus* sp.	AF506382	AF506382
Gloeocystidiellum aspellum	LIN625	China: Taiwan	angiosperm	AF506432	AF506432
Gloeocystidiopsis cryptacanthus	KHL10334	Puerto Rico	–	AF506442	AF506442
Gloeocystidiopsis flammea	AH000219	La Reunion	–	AF506438	AF506438
Megalocystidium chelidonium	LodgeSJ110.1	USA	–	AF506441	AF506441
Megalocystidium leucoxanthum	HK82	Denmark	*Alnus* sp.	AF506420	AF506420
Megalocystidium wakullum	Oslo-930107	Tanzania	–	AF506443	AF506443
Neoaleurodiscus fujii	He2919	China	*Rhododendron* sp.	–	KU574846
Neoaleurodiscus fujii	Wu0807-41	Japan	*Rhododendron* sp.	–	FJ799924
Stereum complicatum	He2234	USA	*Quercus* sp.	KU559368	KU574828
Stereum ostrea	He2067	USA	*Quercus* sp.	KU559366	KU574826
Stereum sanguinolentum	He2111	USA	*Pinus* sp.	KU559367	KU574827
Xylobolus frustulatus	He2231	USA	*Quercus* sp.	–	KU574825
Xylobolus subpileatus	FP106735	USA	*Quercus* sp.	–	AY039309
Outgroups					
Gloeodontia discolor	KHL10099	Puerto Rico	–	AF506445	AF506445
Gloeodontia pyramidata	LR15502	Columbia	–	AF506446	AF506446

[a]Sequences newly generated in this study.

For Bayesian inference (BI), best models of evolution were estimated by using MrModeltest 2.2 (Nylander 2004), and posterior probabilities (BPP) were determined by Markov Chain Monte Carlo sampling in MrBayes 3.1.2 (Ronquist & Huelsenbeck 2003), using the estimated model of evolution. Four simultaneous Markov chains were run for 2 million generations, and trees were sampled every 100th generation. The first quarter of the trees, which represented the burn-in phase of the analyses, were discarded, and the remaining trees were used for calculating posterior probabilities in the majority rule consensus tree.

RESULTS

The ITS+nrLSU sequences dataset contained 30 ITS and 51 nrLSU sequences from 51 samples representing 38 ingroup taxa of Stereaceae and two outgroup taxa (Table 1). Three ITS and eight nrLSU sequences were newly generated (Table 1). The dataset had an aligned length of 1255 characters, of which 286 were parsimony informative. MP analysis yielded 64 equally parsimonious trees (TL = 1292, CI = 0.478, RI = 0.638, RC = 0.305, HI = 0.522). The best-fit evolution model for BI was "GTR+I+G". BI analyses resulted in a phylogenetic tree of similar topology to the MP tree, except for the position of *Aleurodiscus verrucosporus*. The average standard deviation of split frequencies of BI was 0.009620. The strict consensus MP tree is shown in Fig. 1 with both BT values (≥ 50%) and BPPs (≥ 0.95) shown along the branches. The topology of the tree is similar to those of Wu *et al.* (2001) and Larsson & Larsson (2003). In the tree, species of *Aleurodiscus* s.l. formed many lineages, among which four species of *Acanthobasidium* Oberw. grouped together with high supports (BT = 99%, BPPs = 1.00, Fig. 1). *Aleurodiscus dextrinoideophyses* and *A. thailandicus* nested within the *A. cerussatus* group (Bres.) Höhn. & Litsch. in both MP and BI analyses. *Aleurodiscus verrucosporus* clustered with *A. abietis* H.S. Jacks. & P.A. Lemke in MP analyses, but with *Xylobolus* spp. and *A. lividocoeruleum* in BI analyses (Fig. 1).

Aleurodiscus dextrinoideophyses S.H. He, **sp. nov.** **Figs 2A-B, 3**

MycoBank: MB 819753

Diagnosis: The species is distinct by possessing effused basidiocarps, simple-septate generative hyphae, dextrinoid acanthophyses and small smooth basidiospores, and growing on woody bamboos.

Holotype: Thailand. Chiang Rai Province, Doi Pui, on branches of dead woody bamboo, 23 Jul 2016, S.H. He, He 4078 (holotype: BJFC, isotype: MFLU).

Etymology: "*Dextrinoideophyses*" (Lat.) refers to the dextrinoid acanthophyses.

Basidiocarps resupinate, effused, closely adnate, not separable, coriaceous to crustose, first as irregular small patches, later confluent up to 50 cm long, 8 cm wide, 300 μm thick. **Hymenophore** smooth, pale orange (6A3), greyish orange [6B(3-4)], brownish orange [6C(4-6)] to light brown [6D(4-8)], not cracked or densely and finely cracked with age; margin determined, abrupt, concolorous with hymenophore surface, becoming darker with age.

Hyphal system monomitic, generative hyphae simple-septate. **Basal layer** present in juvenile specimens, becoming indistinct with age, generative hyphae in this layer hyaline, thin- to thick-walled, interwoven, moderately branched and

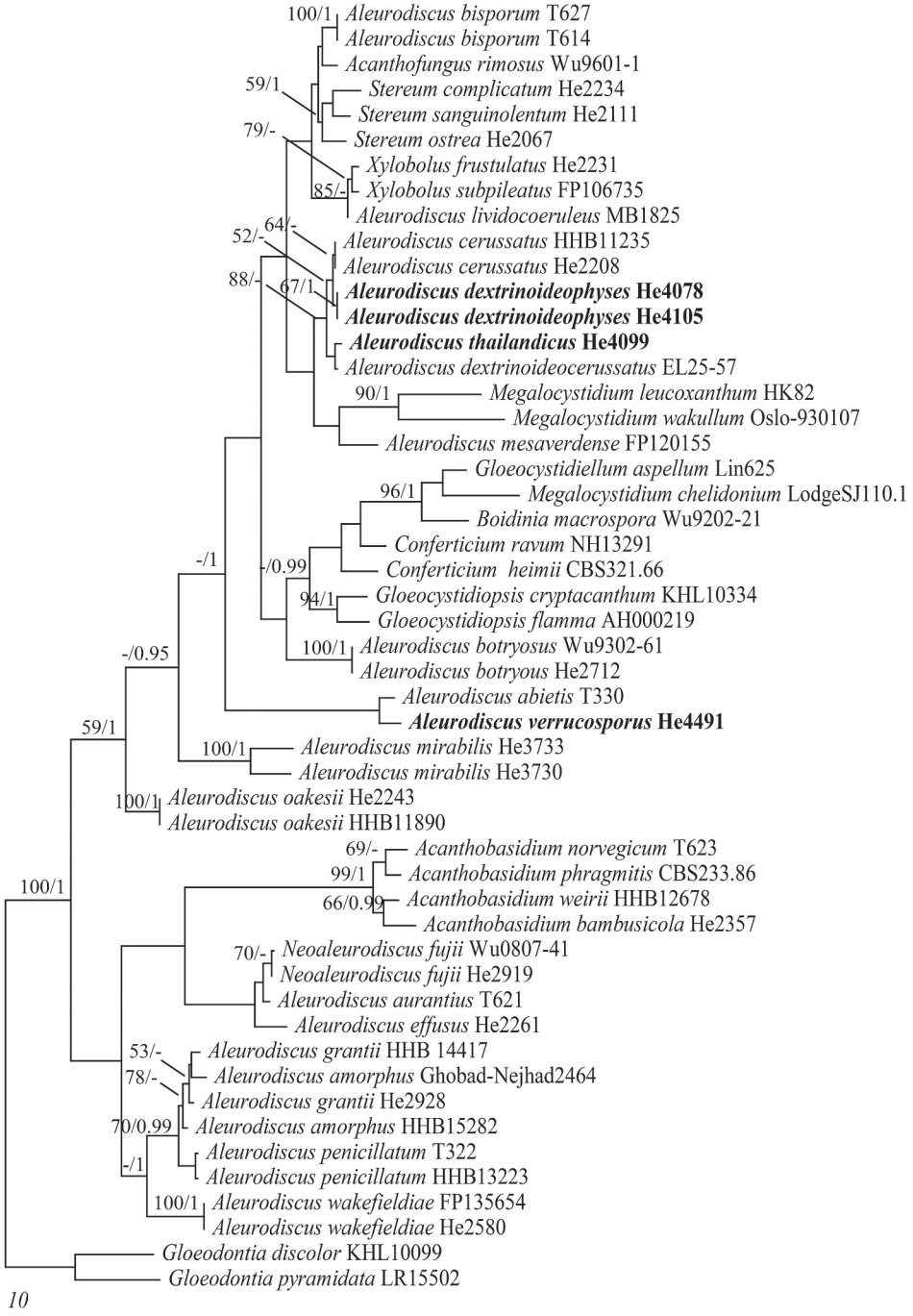

Fig. 1. Strict consensus tree obtained from maximum parsimony analyses of combined ITS and nrLSU sequence data of taxa in Stereaceae. Branches are labeled with parsimony bootstrap values (before slash) ≥ 50% and Bayesian posterior probabilities (after slash) ≥ 0.95.

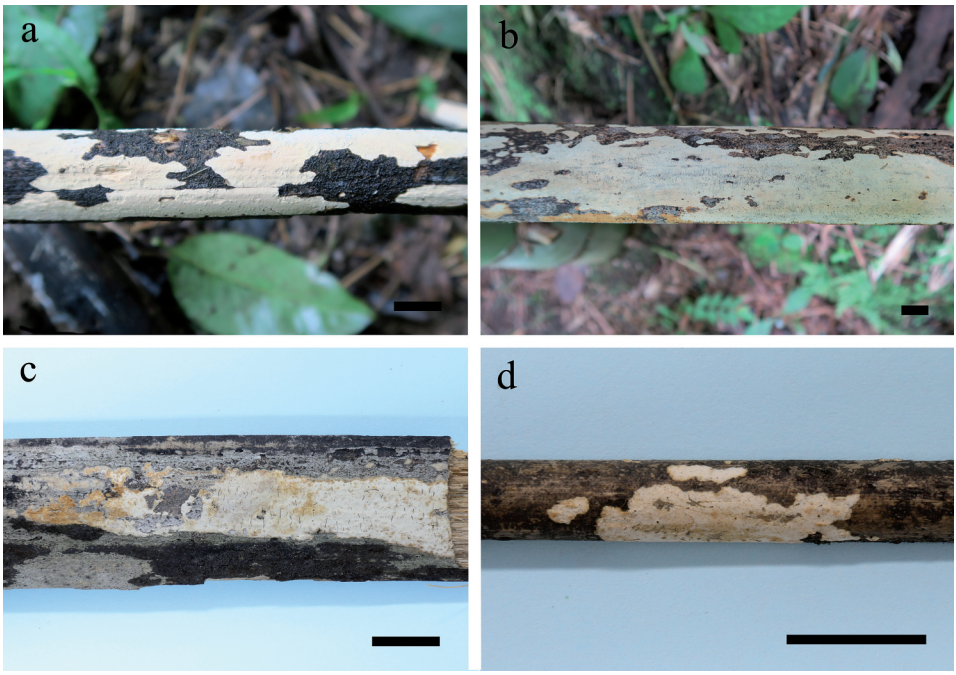

Fig. 2. Basidiocarps of *Aleurodiscus* species. **a, b.** *A. dextrinoideophyses* (a: holotype; b: He4127). **c.** *A. thailandicus* (holotype). **d.** *A. verrucosporus* (holotype). Scale bars = 1 cm.

septate, 2-4 µm in diam. **Subhymenium** thickening with age, composed of generative hyphae, gloeocystidia and acanthophyses. Generative hyphae in this layer hyaline, mostly thin-walled, intermingled with gloeocystidia and acanthophyses, 2-3 µm in diam. **Gloeocystidia** abundant, subclavate to racket-shaped, thick-walled, 15-40 × 10-15 µm. **Acanthophyses** numerous in hymenium and subhymenium, clavate or hyphoid, frequently branched at the apex, hyaline to pale yellow, strongly dextrinoid or not. **Dendrohyphidia** present, similar to hyphoid acanthophyses but larger. **Basidia** clavate to subcylindrical, usually stalked, sometimes with a lateral acanthophysoid appendage, hyaline, thin-walled, with 4 sterigmata up to 5 µm long and a basal simple septum, 20-30 × 4-5 µm; basidioles similar to basidia but smaller. **Basidiospores** ellipsoid, hyaline, thin-walled, smooth, amyloid, 5-7 × 3-4 µm, L = 6.4 µm, W = 3.5 µm, Q = 1.8 (n = 30/1).

Additional specimens examined (paratypes, MFLU): Thailand. Chiang Rai Province, Campus of Mae Fah Luang University, on branches of dead woody bamboo, 21 Jul 2016, S.H. He, He 4032, 4035 & 4040; Doi Pui, on branches of dead woody bamboo, 23 Jul 2016, S.H. He, He 4086. Chiang Mai Province, Doi Saket, on branches of dead woody bamboo, 24 Jul 2016, S.H. He, He 4100, 4102, 4105 & 4110; Mork Fae, on branches of dead woody bamboo, 25 Jul 2016, S.H. He, He 4120 & He4127.

Remarks: Previously, only *A. dextrinoideocerussatus* Manjón, M.N. Blanco & G. Moreno was reported possessing dextrinoid acanthophyses (Núñez & Ryvarden 1997). The species is similar to *A. dextrinoideophyses* in macro- and micro-morphology, but differs in having clamped generative hyphae, moniliform

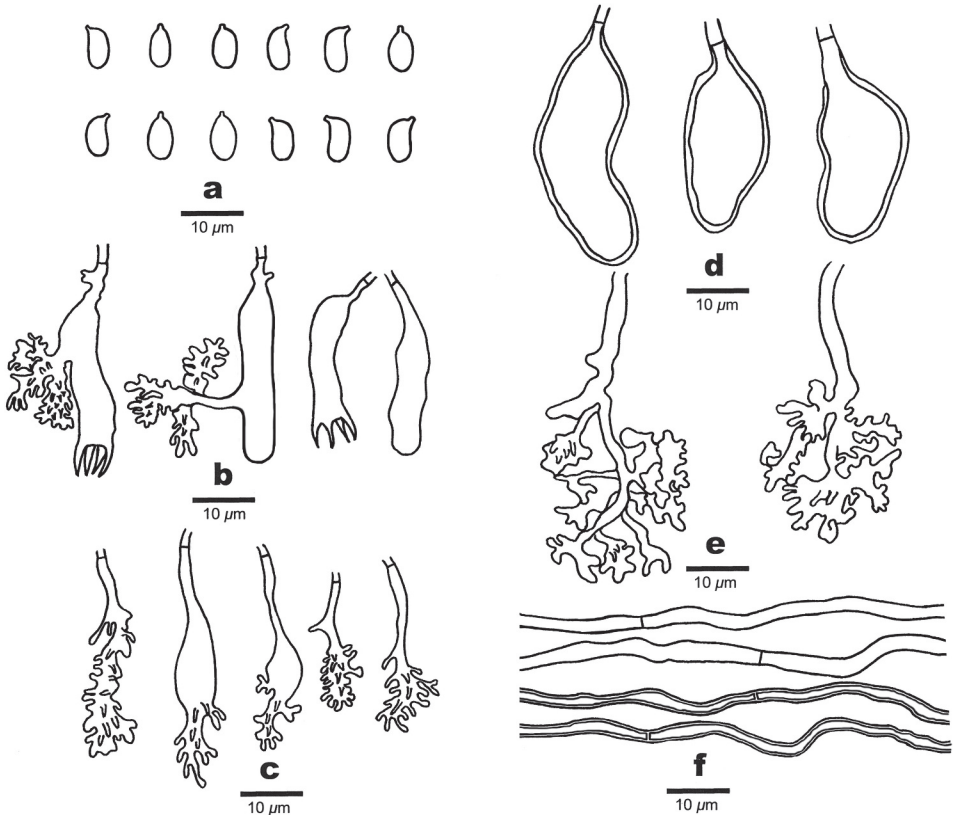

Fig. 3. Microscopic structures of *Aleurodiscus dextrinoidephyses* (drown from holotype). **a.** Basidiospores. **b.** Basidia and basidioles. **c.** Acanthophyses. **d.** Gloeocystidia. **e.** Dendrohyphidia. **f.** Generative hyphae.

gloeocystidia (70-100 × 6-10 µm) and larger basidiospores (7-10 × 4-7 µm), and growing on wood in temperate areas (Núñez & Ryvarden 1997). Superficially, *A. dextrinoidecerussatus* and *A. dextrinoideophyses* resemble *Vararia* in having the dextrinoid acanthophyses. However, the dichohyphae of *Vararia* are distinctly thick-walled and frequently bifurcated (Boidin *et al.* 1980). In addition, both species nested within the *A. cerussatus* group in Stereaceae, whereas, *Vararia* is a member of Peniophoraceae (Larsson & Larsson 2003, Fig. 1).

Aleurodiscus thailandicus S.H. He, **sp. nov.** **Figs 2C, 4**

MycoBank: MB 819754

Diagnosis: The species is distinct by possessing effused basidiocarps, simple-septate generative hyphae, yellow acanthophyses arranged between subhymenium and basal layer, smooth basidiospores, and growing on woody bamboo.

Holotype: Thailand. Chiang Mai Province, Doi Saket, on culm of fallen woody bamboo, 24 Jul 2016, S.H. He, He 4099 (holotype: BJFC, isotype: MFLU).

Etymology: "*Thailandicus*" (Lat.) refers to the type locality in Thailand.

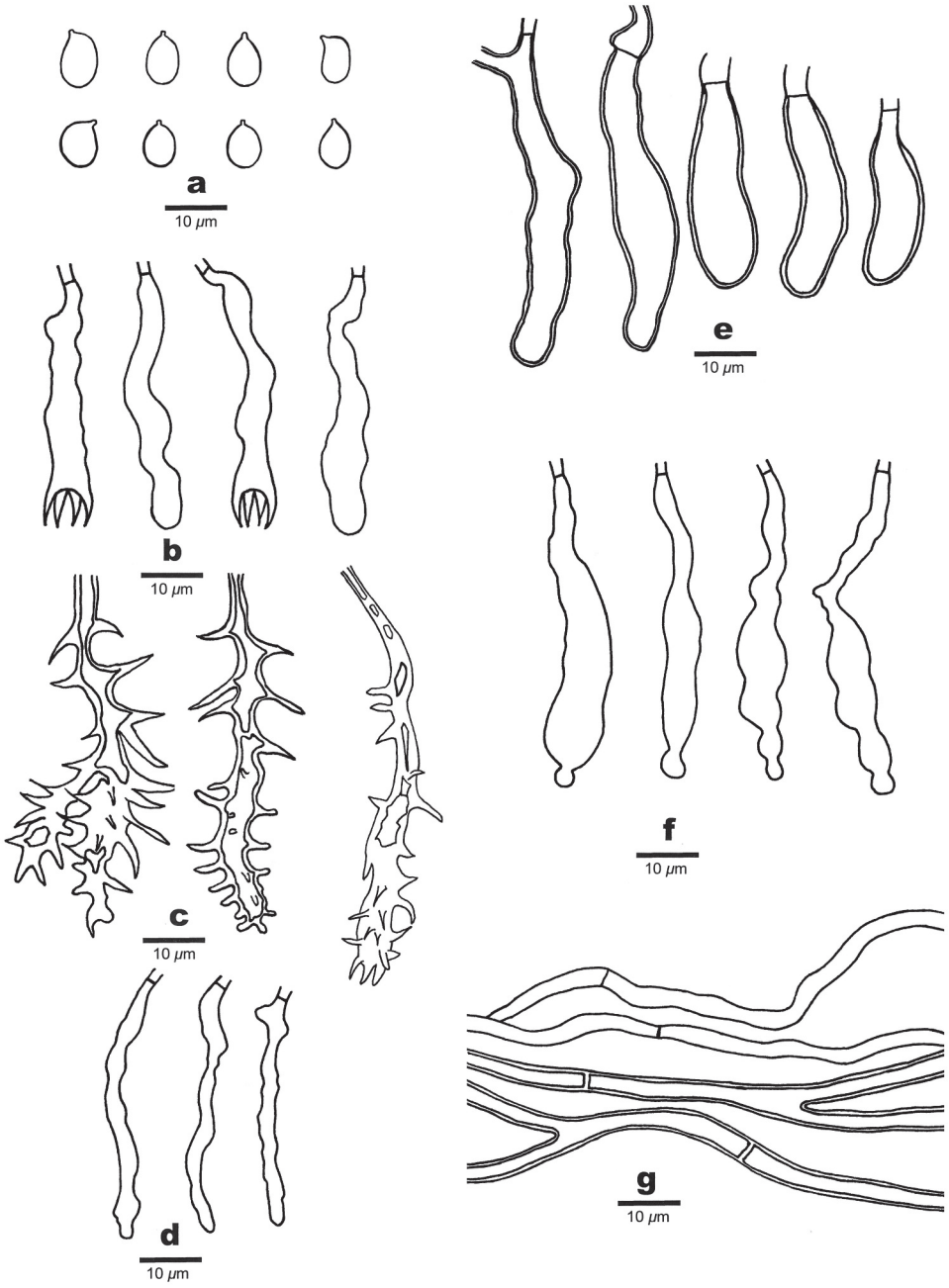

Fig. 4. Microscopic structures of *Aleurodiscus thailandicus* (drown from holotype). **a.** Basidiospores. **b.** Basidia and basidioles. **c.** Acanthophyses. **d.** Hyphidia. **e.** Gloeocystidia from basal layer. **f.** Gloeocystidia from hymenium. **g.** Generative hyphae.

Basidiocarps annual, resupinate, effused, closely adnate, not separable, membranaceous to coriaceous, at first as irregular small patches, later confluent up to 20 cm long, 1 cm wide, 300 μm thick. **Hymenophore** smooth, white (6A1), pale orange (6A3) to light brown [6D(4-8)], slightly cracked upon drying; margin determined, abrupt, concolorous or slightly darker than the hymenophore surface.

Hyphal system monomitic, generative hyphae simple-septate. **Basal hyphae** hyaline, thin- to thick-walled, more or less vertical to the substrate, loosely interwoven, moderately branched, frequently septate, 2-4 μm in diam. **Subhymenial hyphae** hyaline, thin-walled, densely interwoven, frequently branched and septate, 1.5-3 μm in diam. **Gloeocystidia** two types: (1) clavate, subcylindrical or slightly moniliform, thick-walled, intermingled with acanthophyses or embedded in the basal layer, 25-70 × 7-11 μm; (2) typically moniliform with one to several constrictions, thin-walled, embedded in hymenium and subhymenium, 25-45 × 5-6 μm. **Acanthophyses** numerous, clavate or hyphoid with long branches, sometimes dendroid, pale yellow to yellow, thick-walled, arranged in a row between subhymenium and basal layer, 30-55 × 4-6 μm (branches excluded). **Hyphidia** in hymenium abundant, unbranched, hyaline, thin-walled, 2-3 μm in diam. **Basidia** clavate, sinuous, hyaline, thin-walled, with 4 sterigmata up to 9 μm long and a basal simple septum, 25-40 × 5-7 μm; basidioles similar to basidia but slightly smaller. **Basidiospores** ellipsoid to broadly ellipsoid, bearing a distinct apiculus, hyaline, thin-walled, smooth, amyloid, (5-)5.5-7.5(-8) × 3.8-5 μm, L = 6.4 μm, W = 4.4 μm, Q = 1.4-1.5 (n = 60/2).

Additional specimen examined: Thailand. Chiang Mai Province, Doi Saket, on culm of fallen woody bamboo, 24 Jul 2016, S.H. He, He 4104 (paratype: BJFC & MFLU).

Remarks: *Aleurodiscus thailandicus* has acanthophyses and smooth basidiospores, and belongs to the *A. cerussatus* group. However, *A. thailandicus* differs in having a looser texture and yellow acanthophyses arranged between subhymenium and basal layer, and growing on bamboo. In the *A. cerussatus* group, *A. parvisporus* Núñez & Ryvarden is most similar to *A. thailandicus*, but differs in clamped generative hyphae, clavate to ventricose gloeocystidia, and grows on angiosperm branches (Núñez & Ryvarden 1997). The acanthophyses of *A. thailandicus* are similar to those of *A. mirabilis* (Berk. & M.A. Curtis) Höhn., but the latter species has pink and cupulate basidiocarps and larger echinulate basidiospores, and grows on angiosperms (Núñez & Ryvarden 1997). In the phylogenetic tree, *A. thailandicus* nested within the *A. cerussatus* group and formed a lineage with *A. dextrinoideocerussatus* (Fig. 1).

Aleurodiscus verrucosporus S.H. He, **sp. nov.** **Figs 2D, 5**

MycoBank: MB 819755

Diagnosis: The species is distinct by its effused basidiocarps, simple-septate generative hyphae, the absence of acanthophyses, verrucose basidiospores, and growing on herbaceous bamboo.

Holotype: China. Fujian Province, Wuyishan County, Wuyishan Nature Reserve, Huanggangshan, on dead herbaceous bamboo, 17 Aug 2016, S.H. He, He 4491 (holotype: BJFC).

Etymology: "*Verrucosporus*" (Lat.) refers to the verrucose basidiospores.

Basidiocarps resupinate, effused, closely adnate, not separable, coriaceous, first as irregular small patches, later confluent up to 8 cm long, 0.7 cm wide, 200 μm thick. **Hymenophore** smooth, orange white (6A2), pale orange (6A3) to greyish-orange [6B(3-4)]; margin determined, abrupt, concolorous with hymenophore surface.

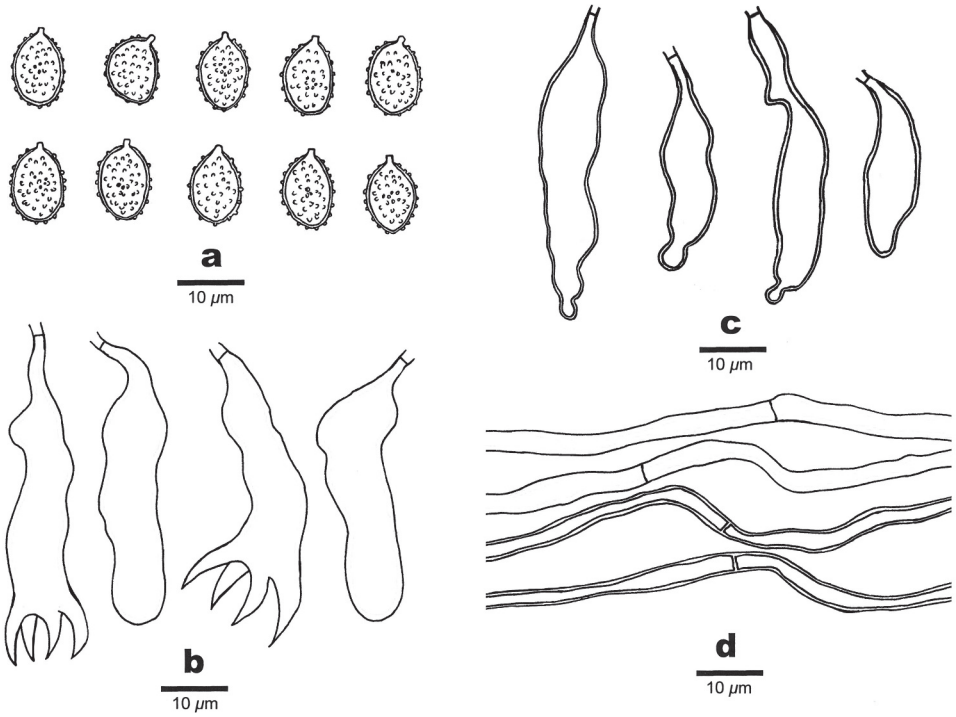

Fig. 5. Microscopic structures of *Aleurodiscus verrucosporus* (drown from holotype). **a.** Basidiospores. **b.** Basidia and basidioles. **c.** Gloeocystidia. **d.** Generative hyphae.

Hyphal system monomitic, generative hyphae simple-septate. **Basal hyphae** hyaline, thin- to thick-walled, more or less regularly arranged, interwoven, moderately branched and septate, 2.5-5 μm in diam. **Subhymenium** thickening, composed of generative hyphae and gloeocystidia. Hyphae in this layer hyaline, thin- to thick-walled, interwoven, frequently branched and septate, 2-3 μm in diam. **Gloeocystidia** ventricose to moniliform, thick-walled, 25-40 × 8-11 μm. **Basidia** clavate, hyaline, thin-walled, with 4 sterigmata up to 11 μm long and a basal simple septum, 40-60 × 8-12 μm; basidioles similar to basidia but slightly smaller. **Basidiospores** ellipsoid to broadly ellipsoid, hyaline, thick-walled, verrucose, strongly amyloid, 8-11.5(-12) × 6-8.5(-9) μm, L = 10.2 μm, W = 7.3 μm, Q = 1.4 (n = 60/2).

Additional specimen examined: China. Fujian Province, Wuyishan County, Wuyishan Nature Reserve, Huanggangshan, on dead herbaceous bamboo, 17 Aug 2016, S.H. He, He 4496 (paratype: BJFC).

Remarks: *Aleurodiscus verrucosporus* is mainly characterized by the absence of acanthophyses, simple-septate generative hyphae and verrucose basidiospores. It is similar to *A. cremicolor* Hjortstam & Ryvarden that is distributed in East Asia, however, *A. cremicolor* has dendrohyphidia and slightly longer basidiospores (12-14 μm), and grows on angiosperms and ferns (Núñez & Ryvarden 1997). *Aleurodiscus botryosus* Burt also resembles *A. verrucosporus*, but differs in

the presence of amyloid botryophyses, larger basidiospores (12-15 × 8-11 μm) and woody substrates (Núñez & Ryvarden 1997). In the phylogenetic analyses, *A. verrucosporus* clustered with *A. abietis* in MP analyses, but with *Xylobolus* spp. and *A. lividocoeruleum* in BI analyses (Fig. 1).

DISCUSSION

Species with resupinate basidiocarps, acanthophyses and smooth basidiospores in *Aleurodiscus* s.l. were placed in the genus *Acanthophysellum* Parmasto by some mycologists (Parmasto 1967, Wu *et al.* 2000, Boidin & Gilles 2001, Bernicchia & Gorjón 2010). However, in the phylogenetic trees, the generic type, *Corticium lividocaeruleum* P. Karst. clustered with *Xylobolus* spp, whereas other species formed the *A. cerussatus* group (Wu *et al.* 2001, Larsson & Larsson 2003, Fig. 1). Thus, for the *Acanthophysellum*, *A. lividocoeruleum* (P. Karst.) Parmasto should be transferred to *Xylobolus*, and a species in the *A. cerussatus* group can be selected as the generic type. However, before this, we prefer to use a broad sense of *Aleurodiscus* for species in this group.

The monotypic genus *Aleurobotrys* Boidin was erected to accommodate *A. botryosus* (Burt) Boidin, Lanq. & Gilles that has amyloid botryophyses and ornamented basidiospores (Boidin *et al.* 1985). In the phylogenetic trees, it was closely related to the *A. cerussatus* group (Wu *et al.* 2001, Larsson & Larsson 2003, Fig. 1). As this group already include species having acanthophyses with or without dextrinoid reactions, the amyloidity of botryophyses may also has no predictive power in phylogeny, and thus *Aleurobotrys* should be treated as a synonym.

Aleurodiscus verrucosporus clustered with different taxa in maximum parsimony and Bayesian analyses. This might be because of the incomplete sampling, and the relatives of *A. verrucosporus* were not included in the phylogenetic analyses.

East Asia is very rich of bamboos which are good and special substrates for some wood-inhabiting fungi, and previously many new polypore species have been described from bamboos in the region (Corner 1989, Choeyklin *et al.* 2009, Dai 2010, Zhou & Jia 2010, Cui *et al.* 2011, Zhao *et al.* 2014, Chen *et al.* 2016). The present paper is an example for corticioid species.

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