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A NEW DISTRIBUTION RECORD OF *DECONICA OVEREEMII* (AGARICALES, STROPHARIACEAE)

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ABSTRAK

Atik Retnowati, Helbert & Supeni Sufaati 2024. Rekaman baru distribusi *Deconica overeemii* (Agaricales, Strophariaceae). Floribunda 7(4): 182–191 — *Deconica overeemii* sebelumnya dilaporkan dari Jawa (Indonesia) dan São Tomé Island (Africa), dan informasi baru distribusi *D. overeemii* dilaporkan dari Sorong, Papua (Indonesia). Spesimen dari jenis *Deconica* ini dikoleksi pada saat melakukan kegiatan eksplorasi jamur ektomikoriza pada bulan Juli 2022. Jenis *D. overeemii* dicirikan dengan warna tudung buah coklat dengan papilla lancip; bilah mempunyai 2–3 anak bilah; basidiospora berbentuk *rhomboid*, dan pleurocystidia berbentuk gada dengan tonjolan pada bagian atasnya. Proses identifikasi koleksi dari Papua dengan menggunakan karakter morfologi dan didukung data molekuler ITS DNA ribosom inti menghasilkan jenis *D. overeemii*. Jenis *Deconica* yang mempunyai kemiripan karakter morfologi dengan *D. overeemii* adalah *D. thailandensis* dan *D. aureicystidiata*. Tulisan ini dilengkapi dengan foto jamur segar, karakter makroskopik dan mikroskopik serta jenis-jenis yang mirip dengan *D. overeemii.*

Kata kunci: Agaricales, *Deconica*, Sorong, taksonomi.

Atik Retnowati, Helbert & Supeni Sufaati 2024. A new distribution record of *Deconica overeemii* (Agaricales, Strophariaceae). Floribunda 7(4): 182–191 — *Deconica overeemii* has been previously reported from Java (Indonesia) and São Tomé Island (Africa), and we reported a new distribution record of the species from Sorong, Papua (Indonesia). The collection of *D. overeemii* was made during the mycological survey to Sorong in July 2022. The species recognized by having brown, with acute-conical papilla pileus, closed with 2–3 lamellulae, ellipsoid-rhomboid basidiospores, and clavate to mucronate-clavate, chryocystidia-like pleurocystidia. The identification process of Papuan materials using morphological characters supported by molecular data derived from ITS nrDNA produced *D. overeemii*. The species is similar to *D. thailandensis* and *D. aureicystidiata*. Fresh images of fruiting bodies, microscopic characters, and similar taxa are provided.

Keywords: Agaricales, *Deconica*, Sorong, taxonomy.

Deconica overeemii (E. Horak & Desjardin) Desjardin & B.A. Perry belongs to the family of Strophariaceae (Basidiomycota, Agaricales). The name "overeemii" was an honor to the big Dutch mycologist, C. van Overeem, who published species of Agaricales from Indonesia in the colonial period, particularly from Java. The species was first described as *Psilocybe overeemii* from Java on the basis of distinctly rhomboid-mitriform, thick-walled basidiospores and clavate chrysocystidia of pleurocystidia (Horak & Desjardin 2006). Desjardin & Perry (2016) then transferred the species to *Deconica*, and named *Deconica overeemii* as a new combination. Material examined of *D. overeemii* collected from Macambrara radio antenna area, São Tomé Island, Africa, on 25 April 2008.

Index Fungorum, accessed on 20 April 2024, listed 90 records of *Deconica* species. Careful examination of those listed *Deconica* species, most of them are firstly described as a *Psilocybe* spp, or vice versa. About 10.000 occurrences of the genus

Deconica in the world can be seen in the Global Biodiversity Information Facility (GBIF), and 4 of those *Deconia* occurrences are in Indonesia.

The Papuan material of *D. overeemii* has intermediate characters between Javanese (Horak & Desjardin 2006) and São Tomé Island material (Desjardin & Perry 2016) that made a good contribution to demonstrating the variability of the morphological characters of the species. However, the BLAST search revealed that 99.10% of the Papuan material is identical to *D. overeemii*.

MATERIALS AND METHODS

Morphological study

The material of *D. overeemii* was collected from Sorong Tourism Area, West Papua, Indonesia. The macroscopic characters of materials were taken before drying. Images of fresh fruiting bodies were photographed in its habitat. The dried material was kept in a sealed plastic Ziplock bag. The colors of basidiomes are referenced to the color codes of Kornerup & Wanscher (1978). The microscopic characters were examined from dried materials rehydrated in KOH (3% aqueous solution), Congo Red (5%), or Melzer's reagent. The spore range was obtained by measuring 25 mature basidiospores. The cited specimen is deposited at the Herbarium Bogoriense (BO).

Molecular study

Isolation, amplification, and sequencing of DNA

The total genomic DNA was extracted from dried fruiting bodies of *Deconica* using the DNeasy Plant Mini Kit (Geneaid, Biotech, Taiwan, ROC), following the recommended procedure. The nuclear ribosomal internal transcribed spacer region (ITS) was amplified using the primer pair ITS4-ITS5 was used (White et al. 1990). The *PCR* products were obtained by amplification *using KOD FX. NeoToyobo/200U (CAT. KFX-201).* All PCR products were purified and Sanger-sequenced by FirstBase (Selangor, Malaysia).

Sequence alignments and phylogenetic analyses

We utilized a dataset from Ramirez-Cruz *et al.* (2020). Sequence annotations were made with ATGC ver.8 (Genetyx, Tokyo, Japan). Sequence assembly and alignment were carried out using MAFFT ver.7 (Katoh & Standley 2013), and curated using TrimAI (Capella-Gutiérrez *et al.* 2009) using web-based services https://ngphylogeny.fr/ (Lemoine *et al.* 2019). The best fit model was identified using ModelFinder (Kalyaanamoorthy *et al.* 2017) based on the Bayesian Information Criterion (BIC) scores. Maximum Likelihood (ML) analyses were conducted in web-based IQ-TREE services (Trifinopoulos *et al.* 2016; http://iqtree.cibiv.univie.ac.at/) with 1000 pseudoreplicates. DNA sequences generated in the present study were deposited in the DNA Data Bank of Japan (DDBJ) GenBank as accessions LC813235 (Table 1).

To identify the best match sequences of an ITS sequence *D. overeemii* from Papua, the Basic Local Alignment Search Tool (BLAST) program was applied, and it shows 99.10% similarity to *D. overeemii* from São Tomé Island, Africa (Figure 1).

Description	Scientific Name	Max Score	Total Score	Query Cover	E value	Per. Ident	Acc. Len	Accession
Deconica overeemii voucher DED 8328 (SFSU) 18S ribosomal RNA gene, partial sequence; internal transcribed s...	Deconica overee...	1002	1002	100%	0.0	99.10%	632	KX017212.1
Deconica thailandensis isolate Ps-430 internal transcribed spacer 1, partial sequence; 5.8S ribosomal RNA gene ...	Deconica thailan...	929	929	100%	0.0	95.34%	577	MT622245.1
Deconica cokeriana isolate PRM922477 internal transcribed spacer 1, partial sequence; 5.8S ribosomal RNA gen...	Deconica cokeria...	915	915	100%	0.0	96.26%	670	MK965914.1

Figure 1. The BLAST search of the Papuan material ITS nrDNA to several GenBank sequences of *Deconica* species

Table 1. List of *Deconica* species, collection codes, country origin, GenBank, and DDBJ accession numbers of sequences used in molecular analyses. The generated sequences of *D. overeemii* from Sorong are in bold.

ITS Accession Number	Species Name	Isolates	Country
MT622203	*Deconica aequatoriae*	Ps–2	Ecuador
MT622204	*D. alpestris*	Ps–4	Austria
MT622205	*D. angustispora*	Ps–7	USA
MT622206	*D. argentina*	Ps–380	Brazil
KM975393	*D. baylisiana*	-	New Zealand
MT622207	*D. bullacea*	Ps–36	Austria

Table 1. List of *Deconica* species, collection codes, country origin, GenBank, and DDBJ accession numbers of sequences used in molecular analyses. The generated sequences of *D. overeemii* from Sorong are in bold. (continued table)

ITS Accession Number	Species Name	Isolates	Country
MT622208	*D. castanella*	EA0619	The Netherlands
MT622209	*D. chionophila*	Zu105	The Netherlands
KM975431	*D. citrispora*	-	New Zealand
KC669315	*D. cokeriana*	UT–1613	USA
MK965913	*D. cokeriana*	Ps–482	USA
MT622211	*D. coprophila*	UT–1576	USA
KC669308	*D. coprophila*	Ps–50	Mexico
MT622210	*D. coprophila*	-	Brazil
MT622214	*D. crobula*	MENu020	Germany
MT622215	*D. crobula*	Vu124	United Kingdom
MT622213	*D. crobula*	DAMu078	The Netherlands
MT622212	*D. crobula*	Ps–95	Italy
MT622216	*D. esperancensis*	Ps–493	Mexico
MT622217	*D. fuegiana*	Ps–275	Finland
MT622218	*D. graminicola*	Ps–87	USA
KC669309	*D. horizontalis*	Ps–463	Brazil
MT622220	*D. horizontalis*	ECV1883	The Netherlands
MT622219	*D. horizontalis*	ECV1919	The Netherlands
KC669310	*D.* aff. *horizontalis*	Ps–434	Costa Rica
MT622223	*D. inquilina*	MEN179	The Netherlands
MT622224	*D. inquilina*	EAu188	The Netherlands
MT622221	*D. inquilina*	EVu194	The Netherlands
MT622222	*D. inquilina*	CUu196	The Netherlands
MT622225	*D. inquilina*	SVu190	The Netherlands
MT622226	*D. magica*	V123	United Kingdom
MT622227	*D. magica*	V237	United Kingdom
MT622228	*D. merdaria*	Ps–117	United Kingdom
KC669314	*D. milvispora*	UT–1606	Australia
MT622230	*D. montana*	Ps–135	Switzerland
MT622232	*D. montana*	MENu186	The Netherlands
MT622231	*D. montana*	VNSu069	The Netherlands
KC669311	*D.* aff. *montana*	Ps–370	Mexico
MT622229	*D.* aff. *montana*	Ps–96	USA
MT622233	*D. neorhombispora*	Ps–279	Brazil
MT622234	*D. neorhombispora*	-	Brazil
KX017212	*D. overeemii*	-	São Tomé (Africa)
KM975401	*D. novae-zelandiae*	-	New Zealand
MT622235	*D. pegleriana*	Ps–153	Brazil
MT622236	*D. phyllogena*	JD72159	The Netherlands
MT622237	*D. physaloides*	Ps–162	Austria
MT622238	*D. pratensis*	MNu189	The Netherlands
KX017213	*D. protea*	-	São Tomé

Table 1. List of *Deconica* species, collection codes, country origin, GenBank, and DDBJ accession numbers of sequences used in molecular analyses. The generated sequences of *D. overeemii* from Sorong are in bold. (continued table)

ITS Accession Number	Species Name	Isolates	Country
MT622239	*D. pseudobullacea*	Ps–171	Nepal
MT622240	*D. semi-inconspicua*	Ps–181	USA
MT622241	*D.* cf. *singeriana*	Ps–418	Brazil
MT622242	*D. subcoprophila*	Ps–206	USA
MT622243	*D. submaritima*	Ps–217	Italy
MT622244	*D. subviscida* var. *subviscida*	MENu013	The Netherlands
MT622246	*D. umbrina*	Ps–429	Malaysia
MT622247	*D. velifera*	Slu210	Austria
KM975441	*D. vorax*	-	New Zealand
KC669312	*D. xeroderma*	Ps–239	Austria
MT622248	*D. xeroderma*	AHv221	Austria
MT622249	*D. xeroderma*	MEN200420	Austria
MT622250	*Deconica* sp. 1	Ps–400	Brazil
MT622251	*Deconica* sp. 2	Ps–414	Brazil
MT622252	*Deconica* sp. 3	Ps–481	USA
MT622253	*Deconica* sp. 4	Ps–406	Brazil
MT622254	*Deconica* sp. 5	Ps–415	Brazil
MT622255	*Deconica* sp. 6	Ps–477	Mexico
KC669313	*Deconica* sp. 7	UT–1574	USA
MT622256	*Deconica* sp. 8	UT–1615	USA
MT622257	*Deconica* sp. 9	Ps–220	Austria
MT622258	*Deconica* sp. 10	Ps–11	Austria
MT622259	*Deconica* sp. 11	UT–1607	USA
MT622260	*Deconica* sp. 12	UT–1575	USA
MT622261	*Deconica* sp. 13	Ps–97	Austria
MT622262	*Deconica* sp. 14	Ps–494	Mexico
MT622263	*Deconica* sp. 15	UT–1580	USA
MT622264	*Deconica* sp. 16	Ps–56	Austria
MT622265	*Deconica* sp. 17	Ps–269	Mexico
KC669316	*Deconica* sp. 18	UT–1581	USA
LC813235	***D. overeemii***	**AR 1297**	**Indonesia (Sorong, Papua)**
MK965912	*Kuehneromyces brunneoalbescens*	UT–1608	Australia

RESULTS

PHYLOGENETIC ANALYSES

We generate one new sequence from the ITS region, and combine it with seventy-eight sequences from Ramirez-Cruz *et al.* (2020) work (Table 1). The alignment and curation of the 79 ITS sequences (outgroup included) resulted in 593 nucleotide sites, which have 62 distinct patterns, 135 parsimony-informative, 81 singleton sites, and 376 constant sites. The best-fit molecular evolution model was TPM2u+F+I+G4. The constructed Maximum Likelihood tree is shown in Figure 2.

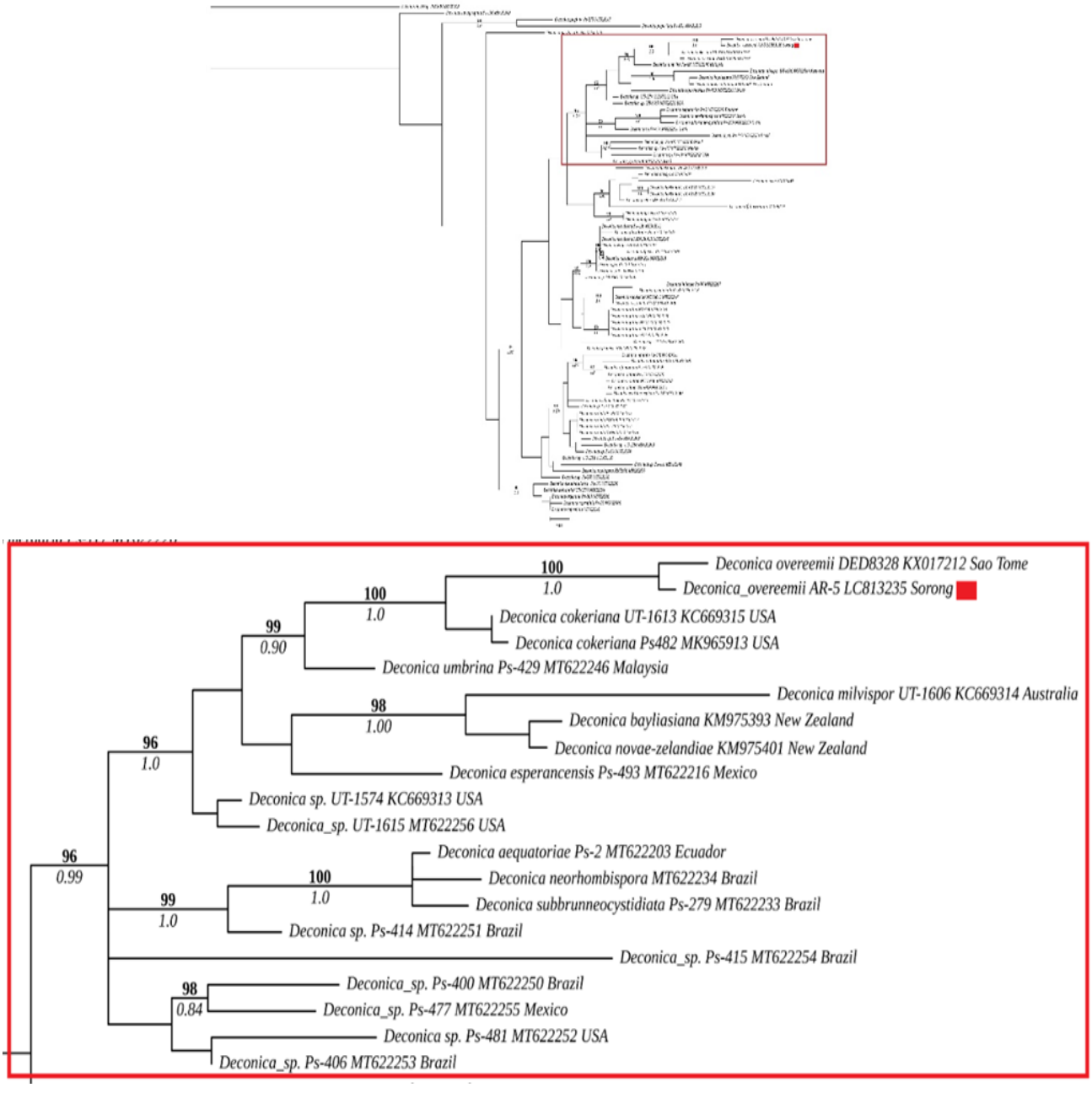

Figure 2. Constructed ML Tree from ITS rDNA sequences of *Deconica*. Maximum likelihood bootstrap support and posterior probability obtained from Bayesian inference are indicated above and below the branches, respectively. Branch lengths are scaled to the expected number of nucleotide substitutions per site. The species described as a new record in this work and its clade are indicated in red box.

The genus *Deconica* that we found in Sorong, were clustered *with D. overeemii* found in Sao Tome, Africa (KX017212) and highly supported (BS=100, PP=1). Most of the species in this cluster (Ramirez-Cruz *et al.* 2020) were dominated by taxa with chrysocystidia, and *D. overeemii* from Sorong have this characteristic. Chrysocystidia is a thick-walled refractive pleurocystidia that becomes a significant character for the genus *Deconica*. Based on locality, most species in this clade are tropical/subtropical origin: Mexico, Brazil, Ecuador, the USA, Malaysia, Sao Tome, Australia, New Zealand and Indonesia.

TAXONOMIC TREATMENT

Deconica overeemii (E. Horak & Desjardin) Desjardin & B.A. Perry. Fig. 3 and 4.

Basionym: *Psilocybe overeemii* E. Horak & Desjardin, Sydowia 58: 30. 2006.

Type: Indonesia (Java), leg. E. Horak 7311 (Holotype: BO 99–130, isotype: XAL, ZT).

Basidiomata medium. Pileus 10–23 mm diam, convex first, then plano-convex in age, with acute-conical papilla, non-striate; surface dull, some hygrophanous, dry; greyish brown (7D3), with paler margin. Context thin, brown. Lamellae adnate, narrow, closed (36–40 reaching stipe), 2–3 lamellulae, lilac tint present, concolorous to pileus. Stipe 2.2–2.5 x 1.5–4 mm, cylindrical, apex smooth to velutinous base, hollow, concolorous to pileus. Odor and taste not distinctive.

Basidiospores 5.12–6.30 × 4.03–5.44 µm (x_m = 5.76 ± 0.30 × 4.86 ± 0.3; Q = 0.97–1.46, Q_m = 1.19 ± 0.11, 25 spores per specimen), rhomboid to ellipsoid, thick-walled up to 0.74 µm, smooth, dark brown, distinctive germ pore. Basidia 14.43–19.23 × 5.26–6.01 µm, clavate, 4-spored. Basidioles clavate. Cheilocystidia common, 7.25–15.96 × 3.02–5.06 µm, clavate to cylindrical, often septate, thin-walled, hyaline. Pleurocystidia 17.49–20.60 × 7.41–10.22 µm, composed of clavate with or without mucronate, refractive, chrysocystidia-like, thick-walled up to 1 µm, yellowish white. Pileipellis cutis, hyphae 2.28–4.64 µm diam, thin-walled, not incrusted, hyaline to yellowish white. Stipe hyphae monomitic, 1.88–7.03 µm diam, thin-walled, cylindrical, parallel, hyaline. Caulocystidia absent. Clamp connection present.

Material examined. Indonesia: West Papua, Sorong, Sorong Tourism Area, 17 July 2022, collected by Papuan Ectomycorrhizal Team, identified by A. Retnowati, AR1297.

Habit and habitat. Gregarious on wood debris.

Distribution. Indonesia (Java and Papua), and Africa.

Notes. *Deconica overeemii* is characterized by having brown, with acute-conical papilla pileus, close with 2–3 lamellulae, rhomboid to ellipsoid basidiospores, and clavate to mucronate-clavate, chryocystidia-like pleurocystidia. *Deconica overeemii* has been reported from Java (Indonesia) by Horak & Desjardin (2006), and São Tomé Island (Africa) by Desjardin & Perry (2016), and Javanese, African, and Papuan material demonstrated the morphological variation of the species, particularly on lamellae, stipe, basidiospores, cheilocystidia, and caulocystidia (Table 2). Morphologically, the size of the pileus, the bluing when exposure, the number of lamellulae, and the shape of cheilocystidia are significant characteristics that separate *D. overeemii* from *D. thailandensis* (Horak et al. 2009). *Deconica ovreemii* is also different from another *Deconica* species from Indonesia, *D. aureicystidiata* (Horak & Desjardin 2006). *Deconica overeemii* differs from *D. aureicystidiata* by having a smaller pileus, less crowded lamellae, the absence of veil remnant, the shape of cheilocystidia, and the absence of caulocystidia.

Comparing the Papuan to Javanese materials, as a type collection, shows several slightly different characters, but those morphological differences are not significant enough to separate them as different species. We considered the morphological differences as morphological variations that are affected by different habitats. Thus, we treated Papuan materials as *D. overeemii*.

Table 2. Morphological feature variations of *D. overeemii* using the Javanese, Papuan, and São Tomé Island materials.

Characters	*Deconica overeemii*		
	Javanese material (Indonesia)	Papuan material (Indonesia)	São Tomé Island material (Africa)
Lamellae			
Series of lamellae	3–5 series	2–3 series	2 series
Spaces	32–40 reaching stipe	36–40 reaching stipe (closed)	closed
Color	tobacco brown with faint lilac tint, becoming dark brick brown	concolorous to pileus, lilac tint present	brown (7E6–8) to dark brown (7F6–7).
Attached lamellae	adnexed	adnate	adnate
Thickness	narrow	narrow	broad
Stipe			
Shape	cylindrical	cylindrical	cylindrical above a subbulbous base
Hollow/solid	solid	hollow	hollow
Size	6–12 × 0.5–0.8 mm	2.2–2.5 × 1.5–4 mm	15–22 × 1–1.5 mm
Hair	apex smooth to subpruinose, subvelutinous to floccose towards base	apex smooth to subvelutinus base	appressed-fibrillose
Base tomentose	present	absent	-
Veil remnants	absent	absent	Present
Microscopic features			
Basidiospores	4.5–5.5 × 4–5 × 3–3.5 µm	5.12–6.30 × 4.03–5.44 µm	5.2–6 × 4.5–5.5. µm
Cheilocystidia	15–25 × 3.5–6 µm, fusoid or sublageniform with slender neck, frequently irregularly branched, hyaline, thin-walled	7.25–15.96 × 3.02–5.06 µm, clavate to cylindrical, often septate, thin-walled, hyaline.	17–23 × 4.5–6.5 µm, subfusoid to lageniform, hyaline, thin-walled.
Caulocystidia	present	absent	present

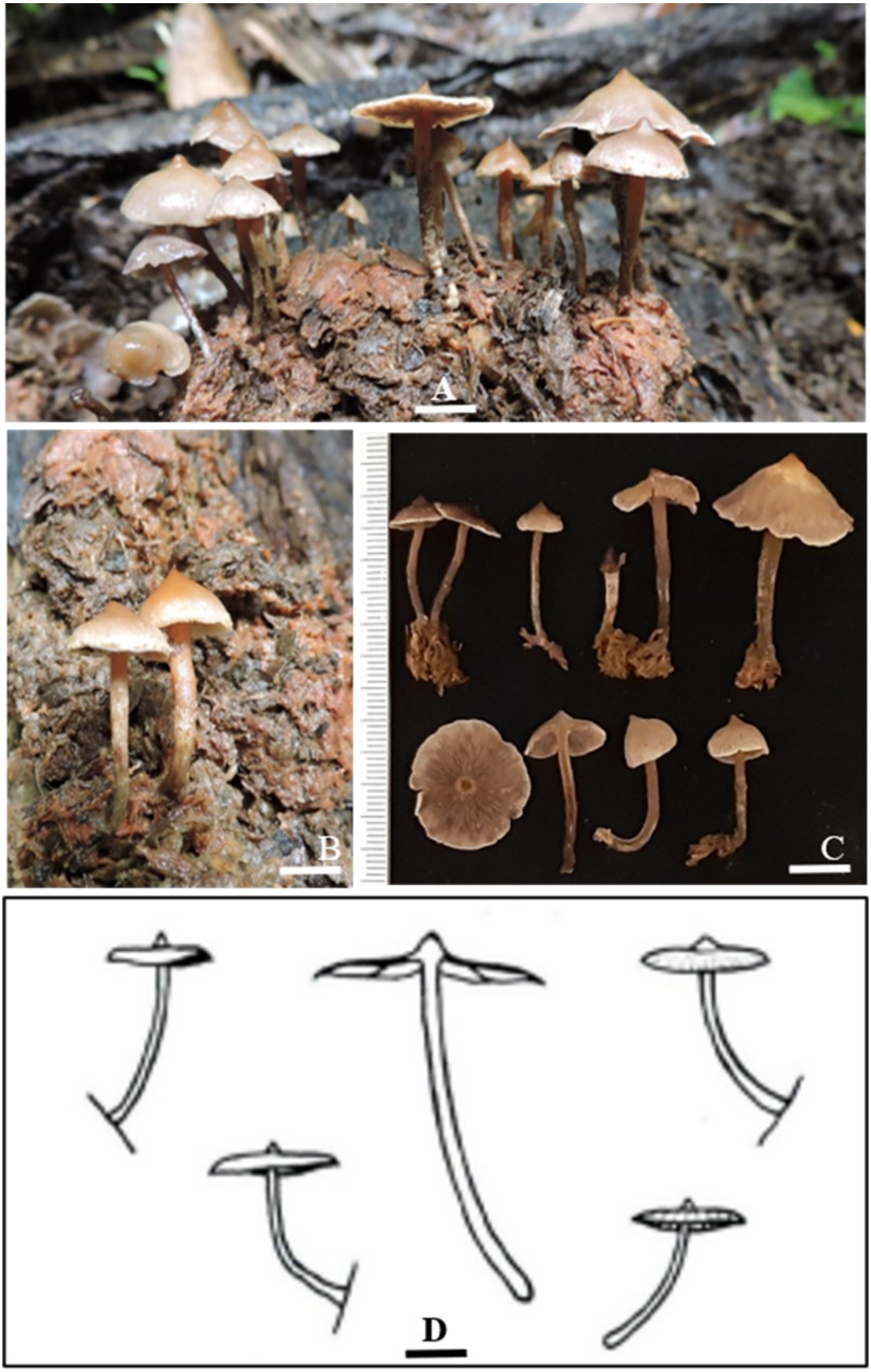

Figure 3. *Deconica overeemii* A, B, and C. Fresh materials of, and D. Line drawing of type collection (Javanese material). (Photo A, B, C : A. Retnowati; D = cited from Horak & Desjarin 2006). Scale Bar: A = 0.66 cm; B = 0.77 cm; C = 0.92 cm, D = 0.3 cm.

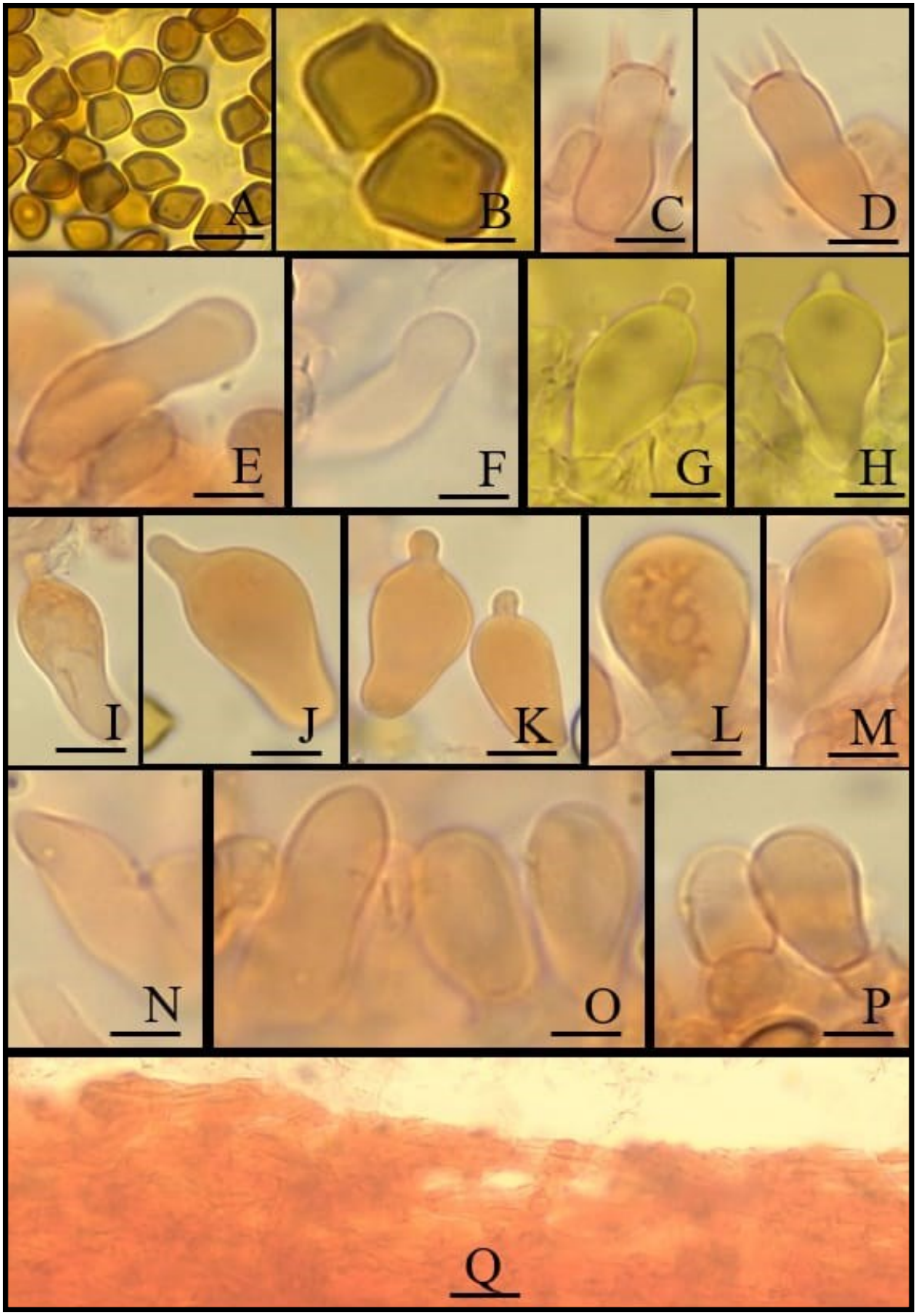

Figure 4. Microscopic characters of D. overeemii: A–B. Basidiospores; C–D. Basidia; E–F. Basidioles; G–M. Pleurocystidia; N–P. Cheilocystidia; Q. Pipelipellis. Scale Bar: A = 7.9 µm; B = 3.15 µm; C–D = 6.4 µm; E–F = 5.5 µm; G–N = 5.9 µm; O-Q = 4.3 µm; R = 15.4 µm.

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