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Novel and rare microfungi associated with *Acrocomia intumescens* and *Attalea oleifera,* native Brazilian palm trees

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Abstract. Palm trees are critical substrates for a diverse array of microfungi, with new species frequently described from these hosts. However, systematic surveys of palm-associated microfungi remain limited, particularly in tropical South America. In a study of microfungi colonizing decomposing rachises and leaflets of *Acrocomia intumescens* and *Attalea oleifera*, two novel species, *Dictyocheirospora acrocomiae* (*Dictyosporiaceae*) and *Melanographium sinuosum*, are proposed based on distinct morphological characteristics. Additionally, two rarely reported species, *Cheiromyceopsis echinulata* and *Phragmospathula brachyspathulata*, are documented and illustrated. These findings enhance our understanding of the biodiversity and ecological significance of palm-associated microfungi in tropical ecosystems.

Key words: altitude swamps, *Arecaceae*, hyphomycetes, Mata Atlântica, palm fungi

Introduction

Palm trees, belonging to the *Arecaceae* family, encompass approximately 2,600 species across 181 genera, thriving primarily in tropical and subtropical regions worldwide (Baker & Dransfield 2016). In Neotropical forests, they can account for up to 60% of the forest's basal area and stem density (Muscarella et al. 2020). Brazil hosts around 390 palm species, predominantly native and concentrated in the Amazon region (Duarte & Amaral 2022). Research highlights palm trees as significant reservoirs of fungal diversity, hosting numerous novel and rare fungal species (Ho et al. 2000; To-Anun et al. 2009; Pereira & Phillips 2023; Karimi et al. 2024; Xiong et al. 2024a, 2025; Zhang et al. 2024). Their widespread distribution, coupled with diverse morphological and chemical traits, promotes extensive fungal colonization, particularly on decomposing leaves (Mercado-Sierra et al. 1997; Pereira & Phillips 2023).

Recent research, particularly in Southeast Asia and Australasia, has significantly advanced our understanding of palm fungal diversity. Approximately 2,500 fungal species have been associated with palm hosts, including 22 newly described genera and over 200 new species (Hyde et al. 1997; Smith & Hyde 2001; Taylor & Hyde 2003; Pinnoi et al. 2006; Pereira & Phillips 2023). Current estimates suggest that fungal species linked to palms may exceed 76,000 (Pereira & Phillips 2023). Studies in tropical environments have consistently highlighted the high specificity of fungal associations with palm substrates and hosts, often at the genus or species level (Hyde et al. 2007). Consequently, investigating fungi on native palm trees, especially those with restricted geographic ranges, is critical for deepening our knowledge of palm mycodiversity and refining global fungal species estimates.

In Brazil, research on palm-associated fungi is still emerging, but has already produced notable contributions, including the discovery of new species and novel records (Farr 1980; Rodrigues & Samuels 1992; Rodrigues 1994; Grandi 1999; Gutiérrez et al. 2009; Monteiro et al. 2019; Vitória et al. 2020; Fortes & Vitória 2022). However, such studies are particularly scarce in the state of Paraíba, Northeast Brazil. To address this gap and enhance our understanding of endemic palm microfungal biodiversity, we conducted a survey of fungi associated with decomposing leaves and rachises of *Acrocomia intumescens* Drude and *Attalea oleifera* Barb. Rodr. These palm species are native to the Atlantic Forest along Brazil's northeastern coast and extend into fragmented forest patches within the Caatinga biome, locally known as "brejos" (Caatinga moist enclaves or

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altitude swamps). Notably, *Attalea oleifera* has a broader distribution, with occurrences also recorded in the Cerrado biome (Pimentel & Tabarelli 2004; Lorenzi et al. 2010; Soares 2025; Viana & Campos-Rocha 2025). These "brejos" are vital conservation areas due to their unique humid microclimates, distinct plant communities, and specific soil and climatic conditions that set them apart from the surrounding Caatinga (Ribeiro et al. 2009).

Material and methods

Fungal surveys were conducted at Parque Estadual Mata do Pau-Ferro in Areia, located in the Brejo Paraibano region of Paraíba, Northeast Brazil (6°58′12″S and 35°42′15″W). Decomposing leaflets and rachises of *A. intumescens* and *At. oleifera* were collected, cut into fragments using pruning shears, and stored in Kraft paper bags for transport. Samples were processed according to the methodology described by Castañeda-Ruiz et al. (2016), at the Laboratory of Microbiology, Department of Biosciences, Center for Agricultural Sciences, Universidade Federal da Paraíba.

Samples were incubated in humid chambers and examined daily for 60 days using a stereomicroscope. When reproductive structures were observed, they were carefully extracted with fine-point insulin needles and mounted in a permanent medium containing PVL resin (polyvinyl alcohol + lactophenol) (Trappe & Schenck 1982). Simultaneously, reproductive structures were transferred to malt agar and carrot cornmeal agar culture media in an effort to establish fungal cultures. Despite multiple attempts, we were unable to successfully isolate the studied species in pure culture. Slides were analyzed under an optical microscope to measure and characterize taxonomically significant reproductive structures. Photomicrographs were captured using an Olympus BX51 compound microscope equipped with differential interference contrast (DIC) and phase contrast (PC), connected to an Olympus DP25 camera controlled by CellD Imaging Software (Olympus). Photo plates were compiled using GIMP (GNU Image Manipulation Program, 2024). All slides were deposited in the EAN Herbarium at the Center for Agricultural Sciences, Universidade Federal da Paraíba.

Results

Taxonomy

Dictyocheirospora acrocomiae L.A. Costa, G.B.P. Souza, Cantillo & Gusmão, sp. nov. (Fig. 1)

MycoBank MB 859621

Diagnosis: *Dictyocheirospora acrocomiae* differs from all other species of the genus by their conidia with rows of cells of diverse sizes.

Holotype: Brazil, Paraíba State: Areia, Parque Estadual Mata do Pau-Ferro (6°58′S and 35°42′W), 22 Oct. 2019, on decaying rachis of *Acrocomia intumescens* Drude, coll. G.B.P. Souza (EAN 31.407).

Etymology. In reference to the host, *Acrocomia*.

Description. Anamorphic fungi, lignicolous. Conidiomata sporodochial, scattered, brown on the natural substrate. Mycelium mostly immersed. Conidiophores micronematous, mononematous, hyaline, thin-walled, short, mostly reduced to conidiogenous cells. Conidiogenous cells holoblastic, integrated, cylindrical, determinate, smooth, hyaline. Conidia solitary, acrogenous, smooth, dry, cheiroid, not complanate, euseptate, pale to medium brown, 43.5–61.25 µm long ($\bar{x}$ = 51.56 µm, n = 20), 22.5–35 µm wide ($\bar{x}$ = 27.02 µm, n = 20), with 6–8 rows of cells, with each row composed of 4–14 cells, the smallest rows 20–37.5 µm long ($\bar{x}$ = 28.56 µm, n = 20) and the largest rows 37.5–50 µm long ($\bar{x}$ = 45 µm, n = 20), without appendages. Conidial secession schyzolytic.

Notes. Phylogenetic analyses of ITS and LSU rDNA sequence data (Tsui et al. 2006) suggested that *Dictyosporium* sensu lato was a paraphyletic genus. As a result, Boonmee et al. (2016), based on both morphological and phylogenetics analyses, formally introduced the family *Dictyosporiaceae*. In the same study, they established four new cheirosporous hyphomycete genera: *Dictyocheirospora* M.J. D'souza, Boonmee & K.D. Hyde, *Dictyopalmispora* Pinruan, Boonmee & K.D. Hyde, *Jalapriya* M.J. D'souza, Hong Y. Su, Z.L. Luo & K.D. Hyde, and *Vikalpa* M.J. D'souza, Boonmee, Bhat & K.D. Hyde. *Dictyocheirospora* was introduced with *D. rotunda* M.J. D'souza, Bhat & K.D. Hyde as the type species, originally collected from submerged decaying wood in freshwater streams in Thailand (Boonmee et al. 2016). In the same work, the authors also described two additional new species: *D. bannica* Kaz. Tanaka, K. Hiray., Boonmee & K.D. Hyde, and *D. vinaya* M.J. D'souza, Bhat & K.D. Hyde. Furthermore, four species were transferred from *Dictyosporium* Corda to this new genus. Morphologically, *Dictyocheirospora* and *Dictyosporium* are similar; however, *Dictyocheirospora* is characterized by cheiroid conidia with rows of cells arranged in different planes and closely gathered at the apex. In contrast, *Dictyosporium* features complanate, non-cheiroid conidia. Currently, a total of 32 *Dictyocheirospora* species are recognized based on morphological features and phylogenetic analyses (Index Fungorum 2025; MycoBank 2025).

Dictyocheirospora acrocomiae represents the third species of this genus described from hosts in the family *Arecaceae*. The first two are *D. indica* (Prasher & Rajn. K. Verma) Jing Yang & K.D. Hyde (as *Dictyosporium indicum*), originally collected from a petiole of *Phoenix rupicola* T. Anderson in India (Yang et al. 2018), and *D. metroxyli* S. Konta & K.D. Hyde, found on dead material of *Metroxylon sagu* Rottb. in Thailand (Phookamsak et al. 2019; Xiong et al. 2024b). A synopsis of the main morphological characteristics of *Dictyocheirospora* species, including the newly described species in this study, is provided in Table 1. *Dictyocheirospora acrocomiae* is distinguished from all other known species in the genus by the presence of one to three conidial rows that are longer than the others (Fig. 1A–B). Furthermore, the rows of conidial cells in this species are not closely gathered at the apex. Palmately divergent rows of this kind have

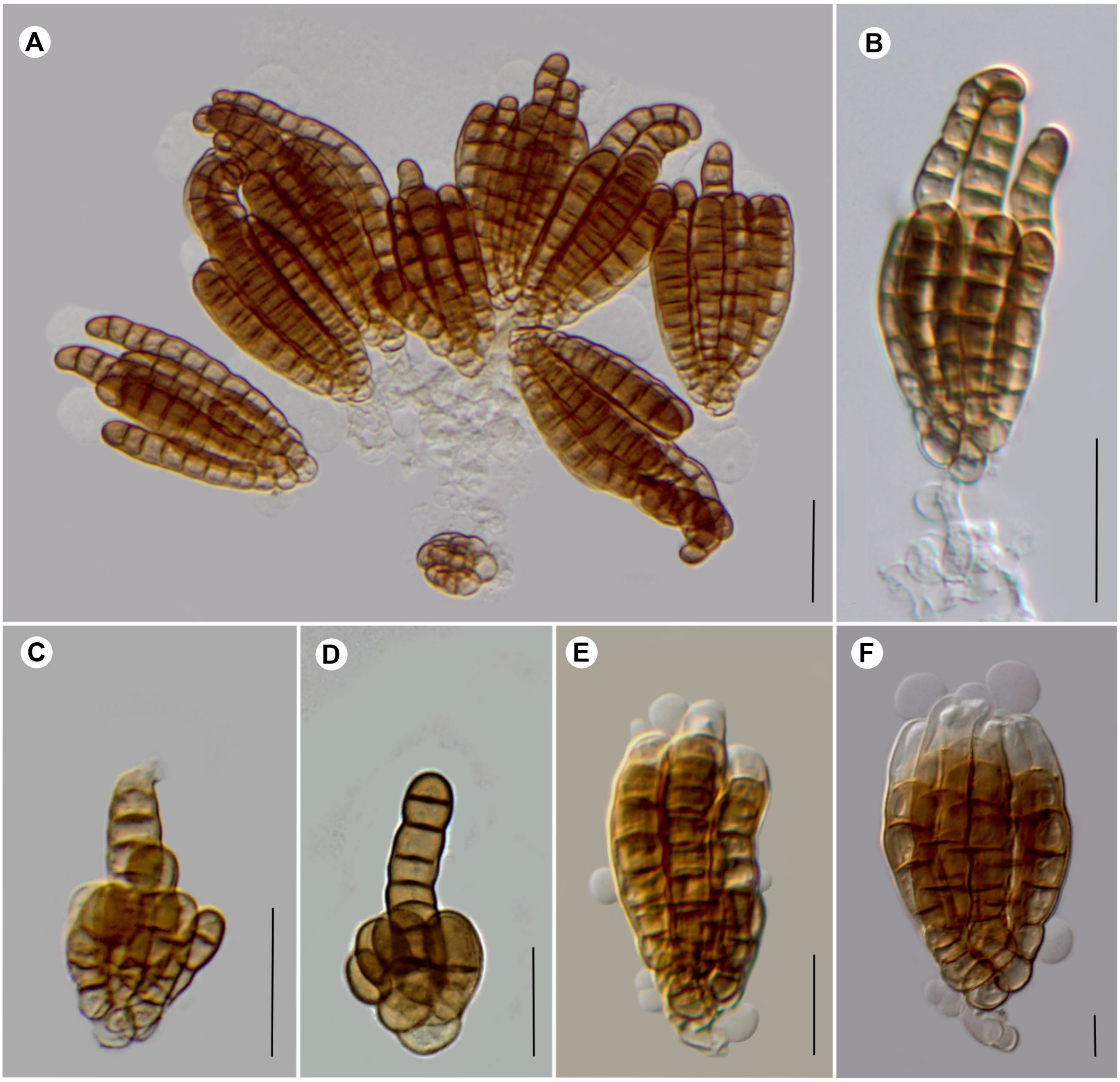

Figure 1. Morphological characteristics of *Dictyocheirospora acrocomia*. A – general aspect; B – mature conidium, conidiophore and conidiogenous cell; C–F – stages of conidial development. Scales: A–C = 20 µm; D, E = 10 µm; F = 5 µm.

also been observed in *D. vinaya* M.J. D'souza, Bhat & K.D. Hyde, particularly when the conidial structures are squashed (Boonmee et al. 2016). Similarly, conidial rows of varying lengths have been reported in young conidia from submerged wood in a freshwater stream (Fu et al. 2021). However, *D. acrocomiae* and *D. vinaya* can be readily distinguished by differences in conidial size and coloration. *Dictyocheirospora vinaya* has larger conidia (58–67 × 15.5–26.5 µm) compared to those of *D. acrocomiae* (43.5–61.25 × 22.5–35 µm). In addition, *D. vinaya* has pale brown conidiogenous cells and brown conidia, whereas *D. acrocomiae* features hyaline conidiogenous cells and conidia that are pale to medium brown.

In terms of conidial size, the species most morphologically similar to *D. acrocomiae* are *D. acaciae* Tennakoon & Lumyong (conidia 42–60 × 15–18 µm, with 5–6 rows of cells) (Tennakoon et al. 2023) and *D. alangii* H.Z. Du, N. Wu & Jian K. Liu (conidia 44–60 × 17–27 µm, with 6–7 rows of cells) (Wu et al. 2024). However, in both species, the conidial rows are uniform in length and not separated. Additionally, *D. acaciae* has darker conidia with fewer rows (5–6), while *D. alangii* produces conidia bearing appendages. *Dictyocheirospora indica* can be distinguished from *D. acrocomiae* by the presence of subapical appendages. *Dictyocheirospora metroxyli* has brown conidia measuring 45–69 × 15–29 µm with 4–6 rows of cells. In contrast, *D. acrocomiae* lacks appendages, has wider conidia (22.5–35 µm), and features more conidial rows (6–8) than *D. metroxyli*.

Melanographium sinuosum L.A. Costa, G.B.P. Souza, J. Mena, Cantillo & Gusmão, sp. nov. (Fig. 2)

MycoBank MB 859622

Diagnosis: *Melanographium sinuosum* differs from all other species in the genus by its conidiophores, which have a distinctly sinuous apex.

Holotype: Brazil, Paraíba State: Areia, Parque Estadual Mata do Pau-Ferro (6°58′S and 35°42′W), 09 Jun. 2020, on

Table 1. Synopsis of the *Dictyocheirospora* species.

Species	Conidia (µm)	Rows of cells	N. of cells for row	Appendage
Dictyocheirospora acaciae	42–60 × 15–18	5–6	9–11	without
Dictyocheirospora acrocomiae	43.75–61.25 × 22.50–35	6–8	6–13	without
Dictyocheirospora alangii	44–60 × 17–27	6–7	8–12	with
Dictyocheirospora appendiculata	50–80 × 17–30	4–7	9–11	with
Dictyocheirospora aquadulcis	60–80 × 17–29	7	11–14	without
Dictyocheirospora aquatica	34–42 × 12.5–19.5	5–6	8–10	without
Dictyocheirospora bannica	73–86 × 21–26	5–7	17–19	without
Dictyocheirospora cheirospora	54–63 × 15–26	5–7	8–12	without
Dictyocheirospora chiangmaiensis	42–46 × 16–18	4–6	9–10	may appear
Dictyocheirospora clematidis	42–60 × 15–30	6–7	10–12	without
Dictyocheirospora garenthjonesii	45.5–54.5 × 15.5–24.5	6–7	7–10	without
Dictyocheirospora gigantica	105–121 × 25–32	7	19–22	without
Dictyocheirospora heptaspora	50–80 × 20–30	7	not available	without
Dictyocheirospora himachalensis	32–48.5 × 14.5–19	7	not available	with
Dictyocheirospora hydei	30–33 × 14–17	7	5–6	with
Dictyocheirospora indica	36–46 × 13–18	6–7	8–10	with
Dictyocheirospora lithocarpi	35–40 × 12–18	6	10–16	without
Dictyocheirospora metroxyloni	45–69 × 15–29	4–6	9–14	without
Dictyocheirospora multiappendiculata	55–62 × 19–22	5–7	9–13	with
Dictyocheirospora musae	45–65 × 20–27	7	not available	with
Dictyocheirospora nabanheensis	35–40 × 18–21	6	6–10	with
Dictyocheirospora pandanicola	60–75 × 18.5–35.5	5–7	13–18	without
Dictyocheirospora pseudomusae	61–78 × 19–29	6–7	13–15	with
Dictyocheirospora rotunda	49–55 × 19.5–22.5	5–7	8–12	without
Dictyocheirospora suae	72–79 × 20–25	5–7	12–15	with
Dictyocheirospora submersa	35–85 × 12–30	6–7	4–16	without
Dictyocheirospora subramanianii	33–42 × 16–20	7	9–13	without
Dictyocheirospora taiwanensis	74–84 × 16–20	5	10–13	without
Dictyocheirospora thailandica	42–65 × 20–45	6–7	not available	without
Dictyocheirospora tetraploides	52.5–72.5 × 18.5–26.5	5	not available	with
Dictyocheirospora vinaya	58–67 × 15.5–26.5	6–7	9–13	without
Dictyocheirospora xishuangbannaensis	35–50 × 17–25	6	6–12	without
Dictyocheirospora xishuiensis	23–31 × 10–13	not available	7–9	may appear

decaying leaflets of *Attalea oleifera* Barb. Rodr., coll. G.B.P. Souza (EAN 31.408).

Etymology. *Sinuosum* (Latin), meaning “sinuous,” refers to the characteristic sinuosity of the conidiophore apices.

Description. Anamorphic fungi, foliicolous. Mycelium immersed. Stromata immersed or partly superficial. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, arising from the upper part of the stroma in loose fascicles, caespitose, unbranched, straight or flexuous, sinuous at the apex, smooth and thick-walled, medium brown, 370–510 µm long ($\bar{x}$ = 458 µm, n = 20), uniform in width, with 3–4 µm at tips ($\bar{x}$ = 3.6 µm, n = 20), slightly broader at the base with 5–6 µm ($\bar{x}$ = 5.6 µm, n = 20). Conidiogenous cells polyblastic, integrated, terminal and intercalary, cylindrical, with sympodial extension, with conidiogenous scars not obvious. Conidia solitary, pleurogenous, dry, reniform, subcymbiform, or obovoid, smooth to verruculose, unicellular, brown, with a hyaline longitudinal slit on the convex side, 14–18 µm long ($\bar{x}$ = 15.4 µm, n = 30), 10–13 µm wide ($\bar{x}$ = 11.4 µm, n = 30). Conidial secession schyzolytic.

Notes. The genus *Melanographium* Sacc. was established by Saccardo (1913) with *M. spleniosporum* Sacc. designated as the type species, isolated from rotten culms of *Bambusa blumeana* Schult. & Schult.f. Members of the genus are characterized by erect, unbranched, brown conidiophores that arise in groups from immersed stromata; polyblastic conidiogenous cells with sympodial extension; and usually reniform, aseptate, brown to dark-brown conidia (Saccardo 1913; Ellis 1963, 1971). Species are chiefly differentiated by the length and aggregation pattern of their conidiophores (solitary, synnematous, loosely fasciculate, or densely fasciculate) and by conidial shape and size (straight, curved, or strongly curved).

The Index Fungorum (2025) and Mycobank (2025) lists 15 species under *Melanographium*. Most are saprobes recorded on decomposing leaves, trunks, stems, culms, or petioles, and they occur predominantly on palm substrates (Hughes 1958; Ellis 1963; Goh & Hyde 1997; Somrithipol & Jones 2005). The taxonomy of *Melanographium* is complicated by a convoluted nomenclatural history that has been repeatedly reassessed. Consequently, several names are treated as *nomen confusum* or *nomen dubium*, and not all published revisions are universally accepted (Hughes 1958; Ellis 1963; Srivastava & Morgan-Jones 1996; Goh & Hyde 1997; Somrithipol & Jones 2005). A summary of the morphological characteristics of 12 *Melanographium* species, excluding those considered

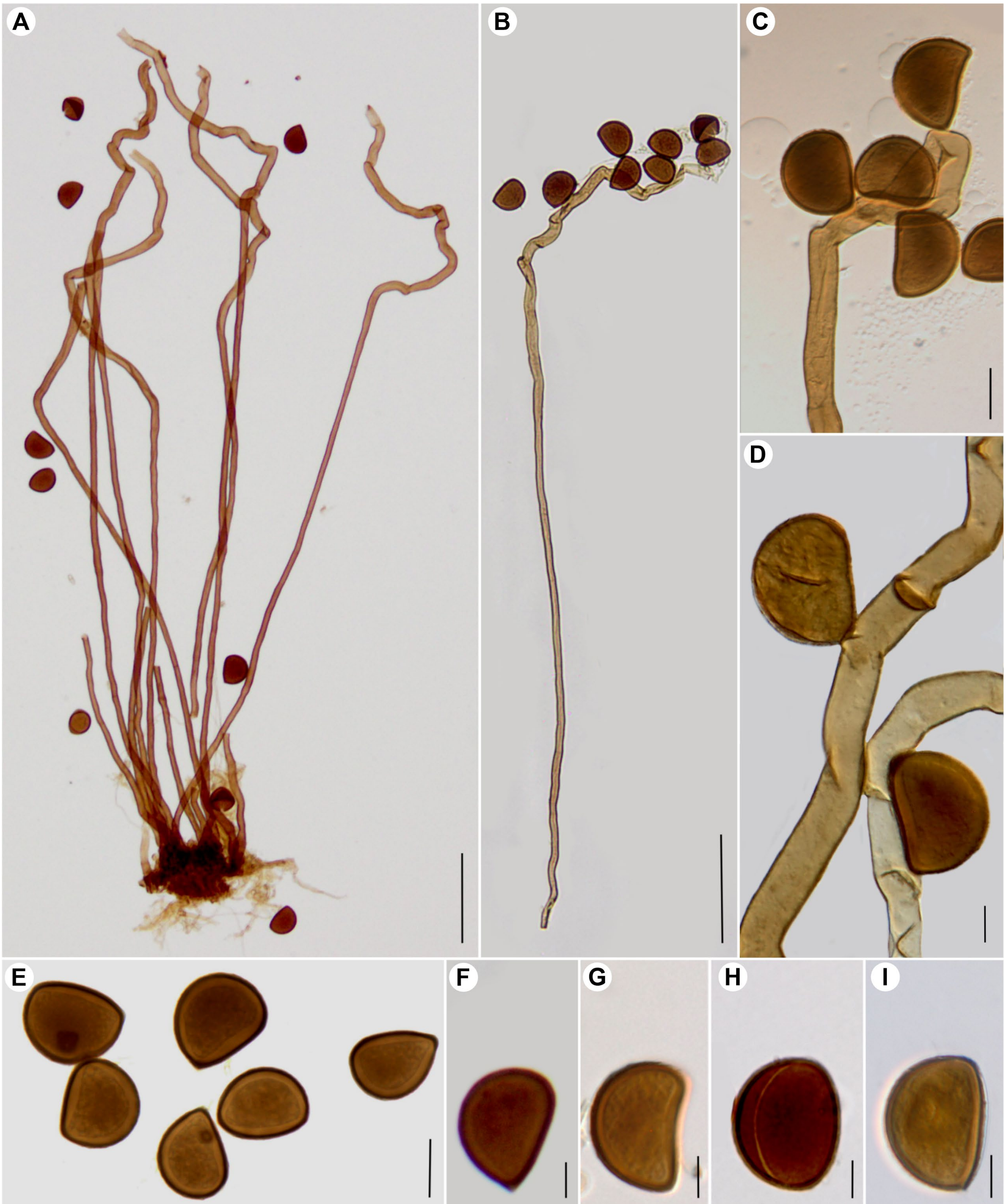

Figure 2. *Melanographium sinuosum*. A, B – general aspect; C, D – terminal and intercalar conidigenic cells; E–I – conidia. Scales: A, B = 50 μm; C, E = 10 μm; D, F–I = 5 μm.

nomen confusum or *nomen dubium*, and including the new species proposed herein, is provided in Table 2.

Currently, molecular data are available for *M. citri* (Gonz. Frag. & Cif.) M.B. Ellis, *M. palmicola* Goh & K.D. Hyde, *M. phoenicis* S.N. Zhang, K.D. Hyde & J.K. Liu, *M. selenioides* (Sacc. & Paol.) M.B. Ellis, and *M. smilacis* Boonmee, Huanraluek & K.D. Hyde (Hyde et al. 2020; Boonmee et al. 2021; Zhang et al. 2024). Among these, sequences for *M. citri*, *M. palmicola*, and *M. selenioides* were derived from reference specimens, following the guidelines proposed by Ariyawansa et al. (2014) for phylogenetic studies when epitypes or neotypes are not available. To date, no molecular data have been obtained from the type species of *Melanographium*, leaving its precise phylogenetic placement unresolved.

Melanographium sinuosum represents the sixth species in the genus reported from hosts in the *Arecaceae* family. Previously documented species from this family include: *M. trachycarpi* I. Hino & Katum. (on decayed petioles of *Trachycarpus fortunei* (Hook.) H. Wendl.); *M. indicum*

Table 2. Synopsis of the *Melanographium* species.

Species	Conidiophores	Conidia
Melanographium calami	In loose or moderately dense fascicles, not compact; conidial scars not obvious	Very strongly curved, horseshoe-shaped, smooth; 10–13 µm wide; brown to dark brown
Melanographium citri	In loose or moderately dense fascicles, not compact; conidial scars not obvious	Curved, reniform or elliptical; smooth or verruculose; 14–19 × 8–13 µm; mid to dark brown
Melanographium cookei	In loose or moderately dense fascicles, not compact; conidial scars not obvious	Curved, broadly pyriform or reniform; mostly smooth; 16–23 × 12–18 µm; very dark brown to dark blackish-brown
Melanographium fasciculatum	In moderately dense fascicles, not compact; conidial scars not obvious	Straight, obovate or limoniform; smooth or verruculose; 13–20 × 8–11 µm; brown to dark brown
Melanographium indicum	In loose or slightly dense fascicles; not compact; conidial scars not obvious	Curved, reniform; smooth; 10.5–15 × 7.5–9,5 µm; dark reddish-brown
Melanographium laxum	Not in fascicles; conidial scars prominent	Slightly curved, obovate or subcymbiform; smooth; 16–20 × 7–10 µm; dark reddish brown
Melanographium palmicola	In moderately dense fascicles, not compact; conidial scars prominent	Slightly curved, ellipsoidal; obovoid or subcymbiform, smooth or verruculose; 15–18 × 8–10 µm; dark olivaceous-brown
Melanographium phoenicis	In loose fascicles or rarely single, not compact; with conidial scar	Conidia reniform to obovoid, 11–18 × 6–9 µm, olivaceous to dark brown, smooth or verruculose.
Melanographium selenoides	In dense, very tightly compacted fascicles; conidial scars not obvious	Curved, reniform; smooth or verruculose; 15–23 × 8–14 µm; mid to dark reddish brown
Melanographium sinuosum	In loose fascicles; conidial scar not so obvious, conidiophores with strongly sinuous apices	Conidia reniform, subcymbiform, obovoid, smooth to subtly warty, 14–18 × 10–13 µm, medium reddish brown
Melanographium smilacis	In moderately dense or loose fascicles, not compact; rarely with percurrent proliferations, with minutely prominent conidial scar	Conidia reniform or broadly obovoid to semicircular, slightly curved, olive to dark brown; 11–17 × 4–13 µm
Melanographium spinulosum	In very loose fascicles; conidial scars prominent	Straight or slightly curved, obovate; coarsely verrucose; 17–23 × 11–15 µm; dark reddish-brown

Saikia & A.K. Sarbhoy (on dead bark of *Calamus viminalis* Willd.); *M. laxum* Rifai (on dead petioles of *Astrocaryum* sp.); *M. calami* N. Srivast., A.K. Srivast. & Kamal (on dead leaf sheaths of *C. tenuis* Roxb.); *M. palmicola* Goh & K.D. Hyde (on decaying rachis of *Archontophoenix alexandrae* (F. Muell.) H. Wendl. & Drude); and *M. phoenicis* S.N. Zhang, K.D. Hyde & J.K. Liu (on decaying rachides of *Phoenix paludosa* Roxb.) (Xiong et al. 2024b; Index Fungorum 2025).

The Brazilian specimen described here is distinguished by a markedly sinuous conidiophore apex, a feature not observed in any other known species of the genus. Its conidial dimensions (14–18 × 10–13 µm) are comparable to those of *M. calami* (10–13 µm wide), *M. citri* (14–19 × 8–13 µm), *M. selenioides* (15–23 × 8–14 µm), and *M. smilacis* (11–17 × 4–13 µm). However, *M. sinuosum* can be distinguished from these species based on conidial morphology, particularly conidial shape. *Melanographium calami* has strongly curved, horseshoe-shaped conidia; *M. citri* and *M. selenioides* exhibit curved, reniform conidia; and *M. smilacis* produces slightly curved, reniform to obovoid conidia. In contrast, conidia of *M. sinuosum* are reniform, subcymbiform, or obovoid. Additionally, *M. selenioides* is synnematous, while *M. sinuosum* lacks this feature.

Cheiromyceopsis echinulata Mercado & J. Mena, Acta Bot. Cubana 53: 2. 1988. (Fig. 3A–E)

Description. Colonies on the substrate, scattered, punctiform. Mycelium immersed in the substrate. Sporodochia, punctiform, dark brown. Conidiophores micronematous, cylindrical, smooth, brown. Conidiogenous cells monoblastic, integrated, terminal, determinate, cylindrical, with up to three extensions, cylindrical, 6.8–10 × 4.5–6.5 µm. Conidia solitary, acrogenous, cheiroid, dark brown, composed of a pedicellate basal cell from which arise 7 rows of cells with equinulate walls, 3–7 septa, 18.5–22.3 × 15.5–18.5 µm. Conidial secession schyzolytic.

Distribution. Brazil (this paper), Cuba (Mercado-Sierra & Mena-Portales 1988; Delgado-Rodríguez et al. 2002; Delgado-Rodríguez & Mena-Portales 2004), India (Pratibha et al. 2011) and Mexico (Arias et al. 2010).

Notes. *Cheiromyceopsis* is a monotypic genus, originally described from the dead petiole and rachis of *Roystonea regia* (Kunth) O.F. Cook in Cuba. Its type species, *C. echinulata* Mercado & J. Mena, has been recorded on this same substrate in Cuba more than ten times (Camino-Vilaró et al. 2006). Despite this apparent affinity for palms, additional reports from *Liquidambar* spp. in Mexico (Arias et al. 2010) and from decaying bark of unidentified trees in India (Prahitba et al. 2011) suggest a broader host range. To date, the species is known only from tropical regions and the Brazilian collection reported here represents the fourth global record and the first from South America. Its precise systematic position remains unresolved because no cultures have yet been established.

The Brazilian specimen exhibits up to three successive extensions on its conidiogenous cells (Fig. 3B), a feature documented here for the first time in this taxon. In all other respects, it agrees with the type description, and molecular data are unavailable. Therefore, we treat the Brazilian specimen as conspecific with *C. echinulata*.

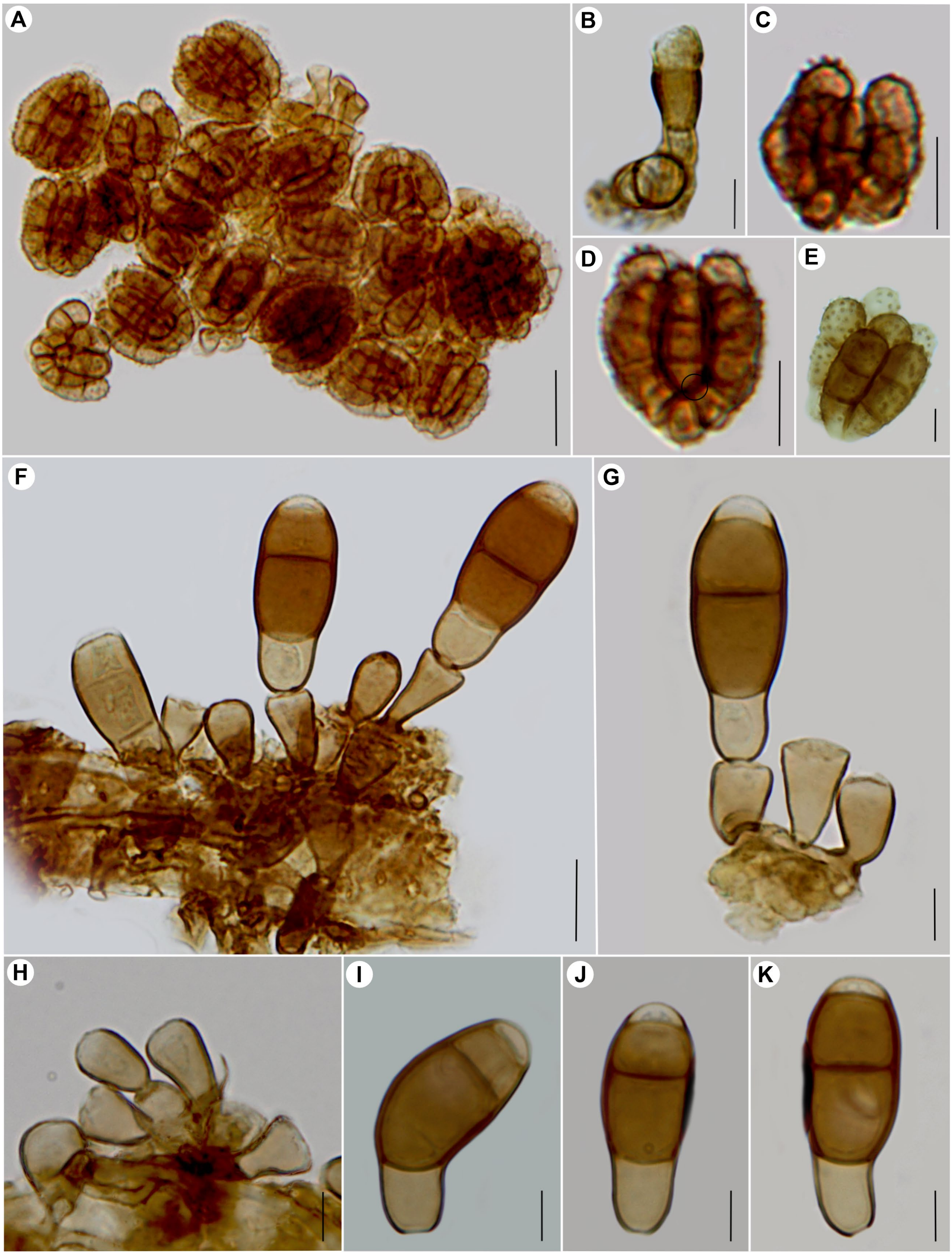

Figure 3. A–E – *Cheiromyceopsis echinulata*. A – general aspect; B – conidiophore and conidiogenic cell; C–E – young conidia; F–K – *Phragmospathula brachyspathulata*. F, G – general aspect; H – conidiophores and conidiogenic cells; I–K – conidia. Scales: A, C, D, F = 10 μm; B, E, G–K = 5 μm.

Material examined. Brazil, Paraiba State: Areia, Parque Estadual Mata do Pau-Ferro (6°58′S and 35°42′W), 05 Nov. 2019, on decaying rachis of *Acrocomia intumescens* Drude, coll. G.B.P. Souza (EAN 31.409).

Phragmospathula brachyspathulata Mercado, Acta Bot. Cubana 5: 2. 1980. (Fig. 3F–K)

Description. Colonies on the substrate effuse, brown to dark brown, with a powdery appearance, forming patches. Mycelium partially superficial, septate and brown. Conidiophores micronematous, indistinguishable from conidiogenous cells. Conidiogenous cells monoblastic, cup-shaped, 9.0–12.5 × 4.5–6.5 µm, sessile, often detaching with the conidium. Conidia solitary, acrogenous, spatulate, euseptate, smooth-walled, with three transverse septa; versicolored, with apical and basal cells paler brown, the basal cell exhibiting a cochleariform concavity; measuring 23.0–29 × 7.5–10.5 µm. Conidial secession schizolytic.

Distribution. Brazil (this paper), Cuba (Mercado-Sierra 1980; Mercado-Sierra et al. 1997; Mena-Portales & Delgado-Rodríguez 2017; Mena-Portales et al. 2020), Spain (Silvera-Simón 2011) and India (Dubey 2019).

Notes. The genus *Phragmospathula* Subram. & N.G. Nair was first described based on material collected from palm trees of the genus *Phoenix* L. (Subramanian & Nair 1966). It is characterized by dispersed, dark brown colonies on the substrate and has been related almost exclusively to palm trees in tropical regions. Morphologically, *P. brachyspathulata* closely resembles the type species, *P. phoenicis* Subram. & N.G. Nair, but differs primarily in conidial cell size, with *P. phoenicis* exhibiting a notably larger basal cell. Moreover, *P. brachyspathulata* possesses a distinct concavity in the basal cell of the conidia, resulting in a characteristic spoon-shaped appearance, an attribute not observed in any other known species within the genus.

The specimen collected in this study has slightly larger conidia than those of the type specimen described by Mercado-Sierra et al. (1997), although the conidial widths are consistent. Reports of *P. brachyspathulata* are rare and less frequent than those of *P. phoenicis*, and the species exhibits a fragmented distribution across tropical regions and Mediterranean climates. This is the first record of *P. brachyspathulata* from a host other than *Roystonea regia* (Kunth) O.F. Cook, suggesting that the species may have a broader geographic distribution and host range than previously recognized. This is the first record of this taxon for continental South America.

Material examined. Brazil, Paraiba State: Areia, Parque Estadual Mata do Pau-Ferro (6°58′S and 35°42′W), 20 Oct. 2019, on decaying raquis of *Acrocomia intumescens* Drude, coll. G.B.P. Souza (EAN 31.410).

Discussion

In this study, we employed classical taxonomic methods to describe two new species and illustrate two rare species of saprobic microfungi. Our findings support previous research indicating that palm trees serve as significant reservoirs of fungal diversity. Notably, several fungi recorded as palm saprobes have also been recovered as endophytes, emphasizing their close association with palm hosts (Taylor et al. 1999). This strong affinity is largely attributed to the high specificity of many fungi in colonizing palm substrates, suggesting an intimate co-evolutionary relationship (Pereira & Phillips 2023).

In addition to host specificity, environmental factors play a critical role in shaping palm-associated fungal diversity. The remarkable adaptability of palms to a wide range of environmental conditions across their global distribution makes them ideal model systems for studying fungal diversity (Pereira & Phillips 2023). Recent research by Zhang et al. (2024) suggests that habitat type has a greater influence on the diversity and specificity of palm-associated fungi than host taxonomy or geographic range, with terrestrial environments showing the highest levels of fungal diversity.

This study demonstrates that palm species with restricted geographic distributions are likely to host a substantial number of yet-undescribed fungal taxa, a pattern influenced by distinctive biotic and abiotic factors (Taylor et al. 2000; Hyde et al. 2007). The discovery of new species underscores the critical role these hosts play as reservoirs of fungal diversity and highlights their significance in refining global estimates of fungal richness. Currently, only about 3.3% of the estimated 76,000 fungal species associated with palms have been described (Pereira & Phillips 2023), indicating that a vast portion of this diversity remains unexplored – particularly in tropical and subtropical regions, where palm diversity is greatest. Therefore, increased funding and targeted research efforts are essential to deepen our understanding of palm-associated fungi and their ecological roles.

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