

Conidial fungi from the semi-arid Caatinga biome of Brazil. *Ellisembiopsis* gen. nov., new variety of *Sporidesmiella* and some notes on *Sporidesmium* complex

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During an inventory of conidial fungi from dead plant material in the semi-arid Caatinga biome of Brazil, some species of *Sporidesmium* complex were found. *Ellisembiopsis brasiliensis* gen. et sp. nov. and *Sporidesmiella garciniae* var. *brasiliensis* var. nov. are proposed, described and illustrated. *Sporidesmium knawiae* is considered synonymous with *Repetophragma inflatum*. Eight new combinations of *Ellisembiopsis* (*E. delavayae*, *E. filirostrata*, *E. ilicis*, *E. magnibrachypa*, *E. ochnae*, *E. phoebes*, *E. pruni*, *E. tarennae*) and, *Ellisembiopsis zhejiangensis* comb. nov. are proposed. A table comparing the main features of *Sporidesmium* and related genera is included.

Key words – *Ellisembiopsis* – *Ellisembiopsis* – *Sporidesmiella* – *Sporidesmiopsis*

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Introduction

The genus *Sporidesmium* Link was reviewed by Ellis (1958). At this time, the genus circumscription included species that have conidiophores solitary or in groups, conidiogenous cells with or without proliferation and smooth or verrucose, euseptate or distoseptate conidia. These characteristics could be segregated in different genera and/or subgenera, and were considered as *Sporidesmium* complex or *Sporidesmium sensu lato* (Sutton & Hodges 1978, Hughes 1979).

Delimitation of the *Sporidesmium* complex was initiated when *Sporidesmiella* P.M. Kirk was erected to included species that have cylindrical to cuneiform or obovate and

distoseptate conidia (Kirk 1982). Later, *Sporidesmiopsis* Subram. & Bhat was proposed to accommodate the species with apically branched conidiophores (Subramanian & Bhat 1987).

Subramanian (1992) divided the *Sporidesmium* complex into seven genera, based on conidia septation, proliferation of conidiogenous cells and presence or absence of conidiophores. Thus, he proposed a new circumscription for *Sporidesmium* and expanded the concept of *Sporidesmiella*. *Sporidesmium* was restricted to those species that have conidiogenous cells without or with irregularly proliferation, and euseptate conidia those species with annellidic proliferation and

distoseptate conidia were included in *Sporidesmiella*.

Hernández-Gutierrez & Sutton (1997) proposed two new genera. *Imimyces* A. Hern. Gut. & B. Sutton for those species with conidiophores associated with lageniform, doliiiform or ovoid conidiogenous cells, with percurrent proliferation and distoseptate conidia, and *Linkosia* A. Hern. Gut. & B. Sutton for species with ampulliform conidiogenous cells, arising directly from the mycelium and producing distoseptate conidia. *Imimyces densus* (Sacc. & Roum.) A. Hern. Gut. & B. Sutton was typified based on *Helminthosporium densum* Sacc. & Roum. (Hernández-Gutierrez & Sutton 1997). However, they probably not studied the type of this species, but a part of the type species of *H. leptosporum* Sacc. & Roum., considered by Ellis (1958) a synonym of *H. densum* (Shoemaker & Hambleton 2001). Hughes (1958) analyzed type material of *H. densum* and *H. leptosporum* considered the first one, synonymous to *Polydesmus elegans* Durieu & Mont. and the last one should not be a synonym of *H. densum*. Thus, Shoemaker & Hambleton (2001) proposed the exclusion of *Imimyces* and proposed a new genus *Imicles* Shoemaker & Hambl. with type species *Imicles leptospora* (Sacc. & Roum.) Shoemaker & Hambl. to accommodate the species previously included in *Imimyces*.

According to Wu & Zhuang (2005), species delimitation of *Sporidesmium-Penzigomyces* and *Ellisembia-Imicles* remain tenuous, and they suggested that the species included in *Penzigomyces* Subram. and *Imicles* should be transferred to *Sporidesmium* and *Ellisembia* respectively.

This paper adopts Subramanian (1992) and the concept of *Polydesmus* proposed by Hernández-Gutierrez & Sutton (1997).

In the last decade, the number of species in the *Sporidesmium* complex has increased (Shi & Zhang 2007, Ma & Zhang 2007ab, Zhang et al. 2008, Ma et al. 2010). Nevertheless, important features such as the conidium septation and conidiophores reduced to conidiogenous cells, have been questioned (Hughes & Illman 1974, Réblová 1999).

Castañeda-Ruiz et al. (2011) proposed a new species and re-disposed taxa in

Repetophragma in accordance with Subramanian (1992). According to this author, macronematous conidiophores with several annellations produced by percurrent proliferations of the conidiogenous cell and euseptate conidia are the diagnostic characters of *Repetophragma*.

A phylogenetic analysis based on partial sequences of LSU nu-rDNA and RPB2 of 27 species and nine genera of the *Sporidesmium* complex, demonstrated multiple evolutionary origins and distributed phylogenetically in Dothideomycetes and Sordariomycetes (Shenoy et al. 2006).

Despite this, Shenoy et al. (2006) favoured maintenance of the genera in the *Sporidesmium* complex, until the sexual phase of these anamorphic fungi are found.

Further studies are needed, with greater sampling effort and the use of more genetic markers for the genera/species to elucidate this complex.

Methods

Expeditions were conducted from 2008 to 2009 in semi-arid Caatinga biome, Northeast of Brazil. Samples of plant litter were collected in separate paper bags and taken to the laboratory where each was incubated at 25° C in Petri dish 'moist chambers'. The plant material was screened at regular intervals for microfungi. Mounts were prepared in polyvinyl alcohol-glycerol (8 g per 100 ml H₂O, 5 ml glycerol). Specimens are deposited in the Herbarium of Universidade Estadual de Feira de Santana (HUEFS).

Results

Ellisembiopsis T.S. Santa Izabel & Gusmão
gen. nov.

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Etymology – related to *Ellisembia* Subram.

Dematiaceous hyphomycetes. Conidiophores macronematous, mononematous, erect, straight or flexuous, branched at the apex, septate, dark brown; conidiogenous cells monoblastic, integrated, lageniform to doliform; conidia solitary, obclavate to fusiform, distoseptate. Secession schizolytic.

Type species – *Ellisembiopsis brasiliensis* T.S. Santa Izabel & Gusmão.

Notes – The genus *Ellisembiopsis* is similar to *Ellisembia* and *Sporidesmiopsis*. It differs from *Ellisembia* by apical branched conidiophores and differing from *Sporidesmiopsis* by distoseptate conidia.

Ellisembiopsis brasiliensis T.S. Santa Izabel & Gusmão **sp. nov.** Fig. 1
Mycobank 803132

Etymology – named for the country where it was collected.

Conidiophores macronematous, mononematous, erect, straight or flexuous, branched at the apex region, 13–15-septate, smooth, dark brown, 270–462 × 16.5–20 µm; apex, 4–7.5 wide; conidiogenous cells monoblastic, integrated, lageniform to doliform, 0–3 proliferations, 8–13 × 4–6 µm; conidia solitary, obclavate to fusiform 5–9-distoseptate, smooth, central cells dark brown, polar cells light brown, 35–80 × 7.5–13.5 µm, 3.5–6 µm wide at the base, 2.5–4 µm wide at the apex. Secession schizolytic.

Teleomorph – not observed on natural substrate.

Know distribution – Brazil.

Material examined – Brazil, Bahia, Morro do Chapéu, on decaying twig, 23 Dec 2008, T.S. Santa Izabel. HUEFS 155102 (holotype). Ibid. on decaying twig, 06 Oct 2008, T.S. Santa Izabel. HUEFS 155101.

Notes – *Ellisembiopsis brasiliensis* is similar to *Sporidesmiopsis zhejiangensis* by possessing distoseptate conidia, however, the latter species has verruculose and smaller conidia with fewer distosepta (5–7) and presence of mucilage at the apex (Wongsawas et al. 2008). *Sporidesmiopsis goanensis* Bhat & Kendr. and *S. dennisii* (Crane & Dumont) Bhat, Kendr. & Nag Raj have 3–4 and 10–15-euseptate conidia, respectively (Bhat & Kendrick 1993, Subramanian & Bhat 1987).

Ellisembiopsis zhejiangensis (Wongsawas, H.K. Wang, K.D. Hyde & F.C. Lin., J.) T.S. Santa Izabel & Gusmão **comb. nov.**
Mycobank 803134

Bas.: *Sporidesmiopsis zhejiangensis* Wongsawas, H.K. Wang, K.D. Hyde & F.C. Lin., J. Zhejiang, Univ., Sci. B 9: 798. 2008.

Sporidesmiella garciniae var. *brasiliensis* T.S. Santa Izabel & Gusmão **var. nov.** Fig. 2
Mycobank 803133

Etymology – named for the country where it was collected.

Conidiophores macronematous, mononematous, solitary or in groups, erect, straight or flexuous, unbranched, smooth, brown, subhyaline at the apex, 32–106 × 3.5–5.5 µm; conidiogenous cells polyblastic, integrated, terminal, cylindrical, smooth, sympodial proliferations or with percurrent and sympodial proliferations; conidia solitary, dry, cylindrical to subcylindrical, smooth, 4-distoseptate, light brown to olive grey, base subhyaline, 22.5–28.5 × 2.5–4.0 µm. Secession schizolytic.

Teleomorph – not observed on natural substrate.

Know distribution – Brazil.

Material examined – Brazil, Bahia, Morro do Chapéu, on dead leaf of an unidentified dicotyledonous plant, 23 May 2008, T.S. Santa Izabel. HUEFS 155106. (holotype).

Notes – The genus *Sporidesmiella* P.M. Kirk comprises 24 species and four varieties (Yanna et al. 2001, Wu & Zhuang 2005). *Sporidesmiella hyalosperma* var. *novae-zelandiae* (S. Hughes) P.M. Kirk and *Sporidesmiella parva* var. *palauensis* Matsush. were proposed by presence of conidiogenous cell with sympodial proliferation, differing from conidiogenous cell with percurrent proliferations commonly present in the genus (Kirk 1982, Matsushima 1985). *Sporidesmiella garciniae* Matsush. var. *garciniae* has larger conidiophores than *S. garciniae* var. *brasiliensis* and has conidiogenous cells only with percurrent proliferations (Matsushima 1985).

Notes – According to Subramanian (1992) *Sporidesmium* and *Ellisembia* differ by possessing euseptate and distoseptate conidia, respectively (Table 1). According to these characteristics and based on original descriptions and illustrations, eight new combinations are proposed for *Ellisembia* (Shi & Zhang 2007, Ma & Zhang 2007a).

Ellisembia delavayae (Cheng K. Shi & X.G. Zhang) T.S. Santa Izabel, A.C. Cruz &

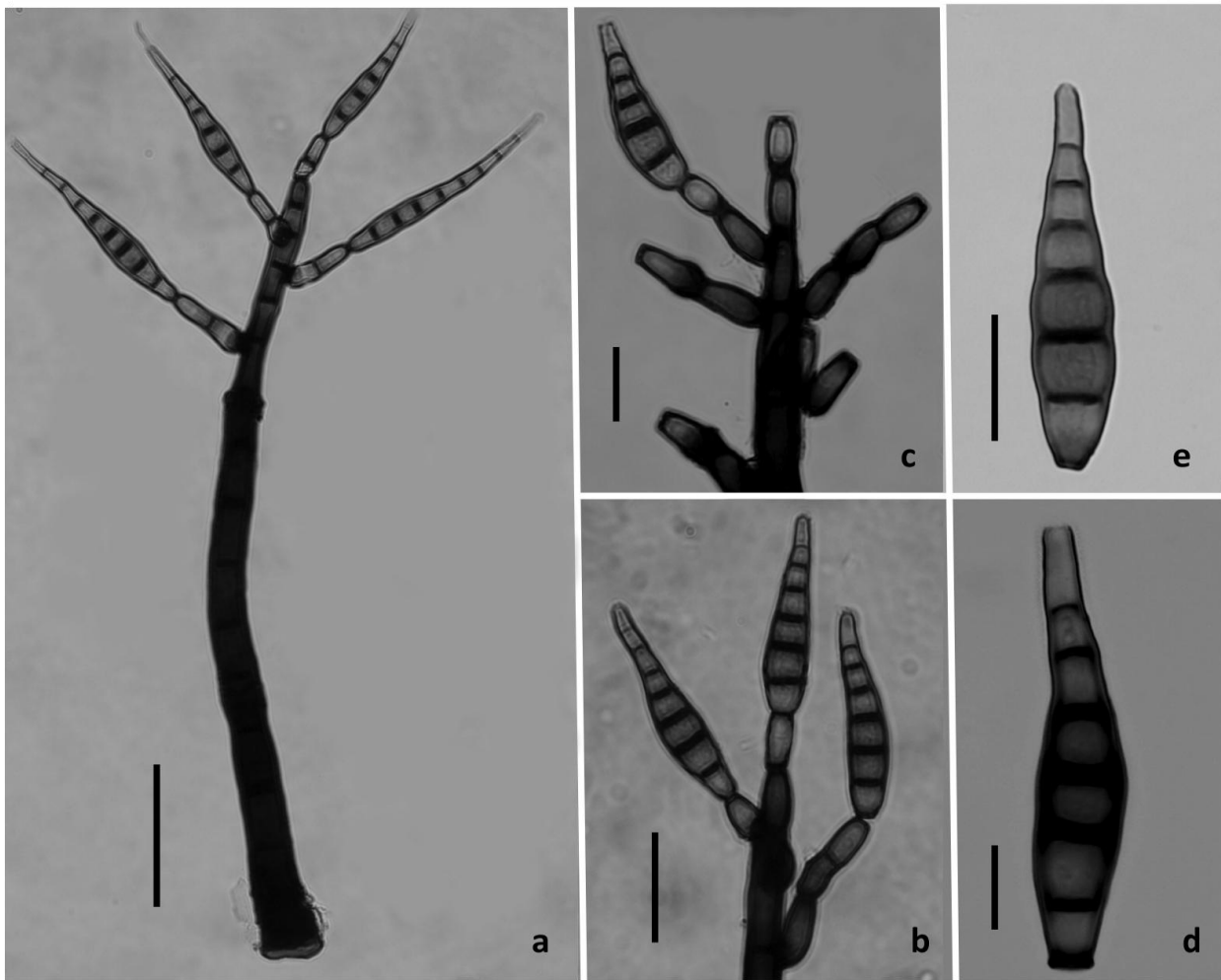


Fig. 1 – **a–e** *Ellisembiopsis brasiliensis*. **a** General aspect. **b–c** Details of branches of conidiophores and conidiogenous cells. **d–e** Conidia. Bars =10 μ m (d); 20 μ m (b, c, e) 50 μ m (a).

Gusmão comb. nov.

Mycobank 803135

Bas.: *Sporidesmium delavayae* Cheng K. Shi & X.G. Zhang, Mycotaxon 99: 359. 2007.

Ellisembia filirostrata (Cabello, Cazau & Aramb.) T.S. Santa Izabel, A.C. Cruz & Gusmão **comb. nov.**

Mycobank 803136

Bas.: *Sporidesmium filirostratum* Cabello, Cazau & Aramb., Mycotaxon 38: 16. 1990.

Ellisembia ilicis (Jian Ma & X.G. Zhang) T.S. Santa Izabel, A.C. Cruz & Gusmão **comb. nov.**

Mycobank 803137

Bas.: *Sporidesmium ilicis* Jian Ma & X.G. Zhang, Mycotaxon 99: 369. 2007.

Ellisembia magnibrachypa (Matsush.) T.S. Santa Izabel, A.C. Cruz & Gusmão **comb. nov.**

Mycobank 803138

Bas.: *Sporidesmium magnibrachypus* Matsush., Icones Microfungorum a Matsushima lectorum: 138. 1975.

Ellisembia ochnae (Cheng K. Shi & X.G. Zhang) T.S. Santa Izabel, A.C. Cruz & Gusmão **comb. nov.**

Mycobank 803139

Bas.: *Sporidesmium ochnae* Cheng K. Shi & X.G. Zhang, Mycotaxon 99: 365. 2007.

Ellisembia phoebes (Cheng K. Shi & X.G. Zhang) T.S. Santa Izabel, A.C. Cruz & Gusmão **comb. nov.**

Mycobank 803140

Bas.: *Sporidesmium phoebes* Cheng K. Shi & X.G. Zhang, Mycotaxon 99: 362. 2007.

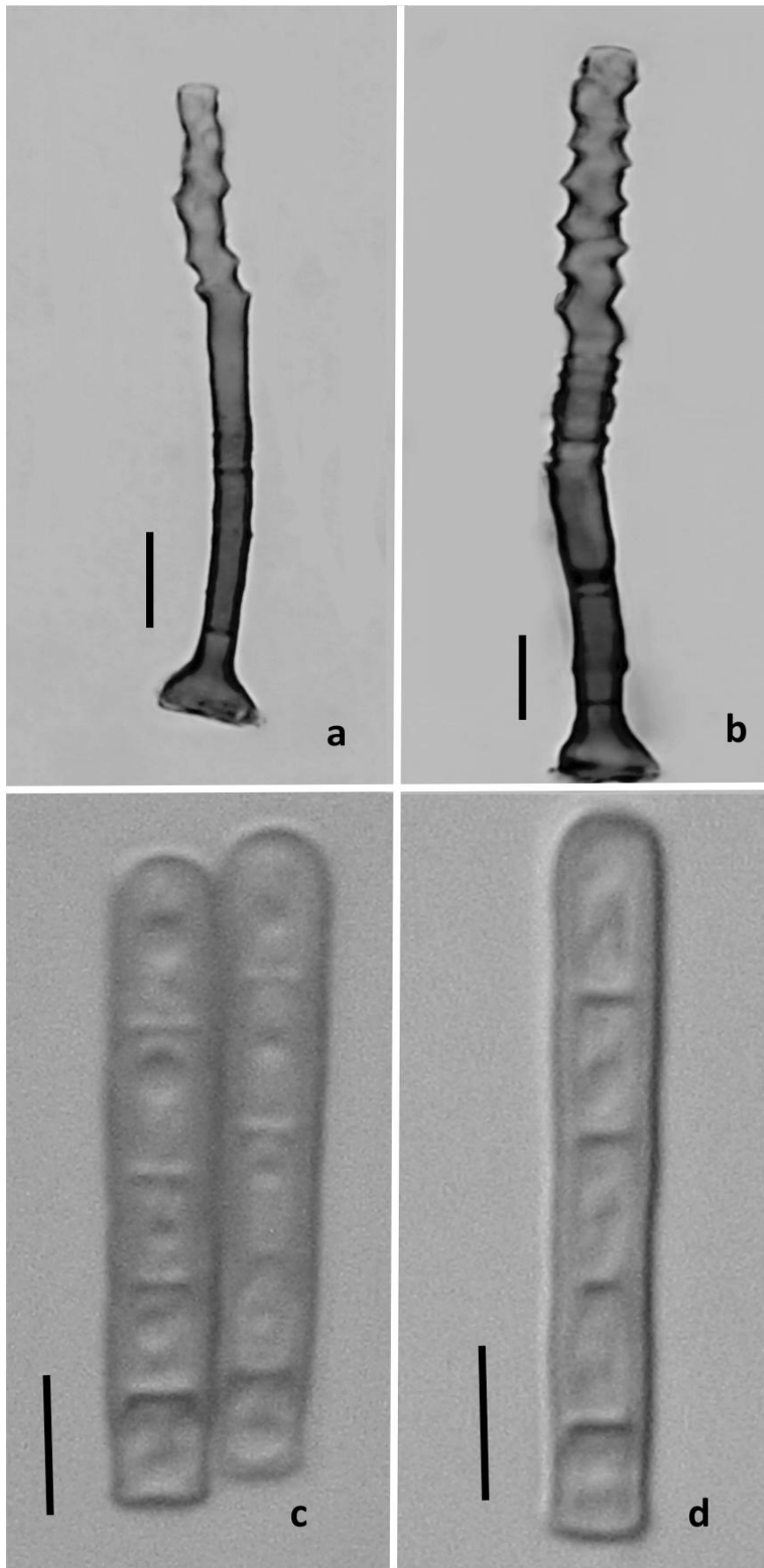


Fig. 2 – *Sporidesmiella garciniae* var. *brasiliensis*. **a** Conidiophores and conidiogenous cells with sympodial proliferations. **b** Conidiophores and conidiogenous cells with sympodial and percurrent proliferations. **c–d**. Conidia. Bars =5µm (c, d) 10 µm (a, b).

Ellisembia pruni (Jian Ma & X.G. Zhang) T.S. Santa Izabel, A.C. Cruz & Gusmão **comb. nov.**
MycoBank 803141

Bas.: *Sporidesmium pruni* Jian Ma & X.G. Zhang, Mycotaxon 99: 369. 2007.

Ellisembia tarennae (Cheng K. Shi & X.G. Zhang) T.S. Santa Izabel, A.C. Cruz & Gusmão **comb. nov.**
MycoBank 803142

Bas.: *Sporidesmium tarennae* Cheng K. Shi & X.G. Zhang, Mycotaxon 99: 361. 2007.

Repetophragma inflatum (Berk. & Ravenel) W.P. Wu, Fung. Divers. Res. Ser. 15: 109, 2005.

Bas.: *Helminthosporium inflatum* Berk. & Ravenel, Grevillea 3: 104. 1875.

Syn.: *Helminthosporium subfuscum* Berk. & M.A. Curtis, Grevillea 3: 104. 1875.

Helminthosporium tiara Berk. & Ravenel, Grevillea 3(27): 104. 1875.

Helminthosporium episphaericum Cooke & Peck, Rep. N.Y. St. Mus. nat. Hist. 29: 52. 1878.

Helminthosporium collabendum Cooke, Grevillea 17: 67. 1889.

Clasterosporium herculeum Ellis, Proc. Acad. nat. Sci. Philad.: 92. 1891.

Clasterosporium sigmoideum Ellis & Everh., Bull. Torrey bot. Club 24: 472. 1897.

Sporidesmium inflatum (Berk. & Ravenel) M.B. Ellis, Mycol. Pap. 70: 70. 1958.

Sporidesmium knawiae Crous, Fungal Planet 29. 2008. **syn. nov.**

Material examined – Brazil, Piauí, Caracol, on decaying twig, 5 Dec 2006. ACR Cruz, HUEFS 130991.

Note – *Sporidesmium knawiae* proposed by Crous (2008) is phylogenetically and morphologically similar to *Repetophragma inflatum*. The characteristics of this species are fully included in the morphological variation of the species previously described by Ellis (1958). Thus, it is proposed to make *Sporidesmium knawiae* a synonym of *Repetophragma inflatum*.

Other species of *Sporidesmium* complex found in semi-arid region

Ellisembia adscendens (Berk.) Subram., Proc. Indian natn Sci. Acad., Part B. Biol. Sci. 58(4): 183. 1992.

Material examined – Brazil, Bahia, Morro do Chapéu, on dead bark, 19 May 2008, T.S. Santa Izabel. HUEFS 155127. 21 Oct. 2008, T.S. Santa Izabel. HUEFS 155128, 9 Jan 2009, T.S. Santa Izabel. HUEFS 155129; on decaying twig, 23 May 2008, T.S. Santa Izabel. HUEFS 155130, 7 Oct 2008, T.S. Santa Izabel. HUEFS 155131, 31 Jan 2008, T.S. Santa Izabel. HUEFS 155132.

Ellisembia brachypus (Ellis & Everh.)

Subram., Proc. Indian natn Sci. Acad., Part B. Biol. Sci. 58: 183. 1992.

Material examined – Brazil, Bahia, Morro do Chapéu, on decaying twig, 2 Oct 2008, T.S. Santa Izabel. HUEFS 155133.

Ellisembia vaga (Nees & T. Nees) Subram., Proc. Indian Natn. Sci. Acad., Part B. Biol. Sci. 58(4): 184. 1992.

Material examined – Brazil, Bahia, Morro do Chapéu, on decaying twig, 20 Jul 2008, T.S. Santa Izabel, HUEFS 155104.

Sporidesmiella aspera Kuthub. & Nawawi, Mycol. Res. 97(11): 1305.1993.

Material examined – Brazil, Bahia, Morro do Chapéu, on dead leaves, 24 Oct 2008, T.S. Santa Izabel. HUEFS 155136; on dead bark, 23 May 2008, T.S. Santa Izabel, HUEFS 155137; 17 Feb 2008, T.S. Santa Izabel, HUEFS 155138; on decaying twig, 23 Dec 2008, T.S. Santa Izabel. HUEFS 155139.

Sporidesmiella cuneiformis (B. Sutton) P.M. Kirk, Trans. Br. mycol. Soc. 79(3): 481. 1982.

Material examined – Brazil, Bahia, Morro do Chapéu, on decaying twig, 11 Jun 2008, T.S. Santa Izabel. HUEFS 155140.

Table 1 Main features of *Sporidesmium* complex and related genera.

Genera	Condiophores	Conidiogenous cells	Conidia
<i>Ellisembia</i>	Present	Irregular proliferations	Distoseptate/unbranched/appendage
<i>Ellisembiopsis</i>	Present/Branched	Percurrent proliferations	Distoseptate
<i>Imicles</i>	Present	Percurrent proliferations	Distoseptate/unbranched/appendage
<i>Janetia</i>	Absent	Without proliferations	Euseptate/Distoseptate
<i>Linkosia</i>	Absent	Without proliferations	Distoseptate
<i>Lomaantha</i>	Present	Without proliferations	Distoseptate/branched
<i>Morrisiella</i>	Synnematous	Without proliferations	Distoseptate
<i>Neosporidesmium</i>	Synnematous	Percurrent proliferations	Distoseptate/unbranched/appendage
<i>Novozymia</i>	Synnematous	Annelidic proliferations	Distoseptate/unbranched/appendage
<i>Penzigomyces</i>	Present	Percurrent proliferations	Euseptate/unbranched/appendage
<i>Polydesmus</i>	Present	Without proliferations	Euseptate
<i>Repetophragma</i>	Present	Annelidic proliferations	Euseptate
<i>Sporidesmiella</i>	Present	Annelidic proliferations	Distoseptate/unbranched or branched/ appendage
<i>Sporidesmina</i>	Synnematous	Without proliferations	Euseptate/Distoseptate
<i>Sporidesmiopsis</i>	Present/Branched	Percurrent proliferations	Euseptate
<i>Stanjehughesia</i>	Absent	Without proliferations	Euseptate

Sporidesmium tropicale var. *tropicale* M.B. Ellis, Mycol. Pap. 70: 58. 1958.

Material examined – Brazil, Bahia, Morro do Chapéu, on dead bark, 13 Feb 2008, T.S. Santa Izabel. HUEFS 155141.

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