

First records of xylophilous Basidiomycetes (Fungi) in Mondaí, Santa Catarina (Southern Brazil)

Marisa de Campos-Santana*

Clarice Loguercio-Leite

Laboratório de Micologia, Departamento de Botânica, Centro de Ciências Biológicas, Universidade Federal de Santa Catarina
CEP 88010-970, Florianópolis – SC, Brazil

*Author for correspondence
marisacampossantana@yahoo.com.br

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Abstract

A taxonomic survey of xylophilous Basidiomycetes resulted in the identification of 21 species belonging to the families Boreostereaceae Jülich (1), Ganodermataceae Donk (2), Hymenochaetaceae Imazeki & Toki (6), Meripilaceae Jülich (2), Podoscyphaceae Reid (1), Polyporaceae Fr.: Corda (8) and Schizophyllaceae Quél. (1). All species are new records for Mondaí.

Key words: taxonomy, Basidiomycota, mycodiversity

Resumo

Primeiras citações de Basidiomycetes (Fungi) xilófilos para Mondaí, Santa Catarina, Brasil. Um levantamento taxonômico de Basidiomycetes xilófilos resultou na identificação de 21 espécies pertencentes às famílias Boreostereaceae Jülich (1), Ganodermataceae Donk (2), Hymenochaetaceae Imazeki & Toki (6), Meripilaceae Jülich (2), Podoscyphaceae Reid (1), Polyporaceae Fr.: Corda (8) e Schizophyllaceae Quél. (1). Todas as espécies são novas citações para Mondaí.

Unitermos: taxonomia, Basidiomycota, micodiversidade

Introduction

The diversity shown in the fungus kingdom is surprising for its immense distribution and association with organic and inorganic substrates. The Fungi comprise one of the largest groups of eukariota in terrestrial environments, after insects (Fröhlich and Hyde, 1999). But knowledge of the mycodiversity is still extraordinarily deficient and fragmentary, making inventory di-

fficult due primarily to the insufficient number of researchers in this area (Müeller and Bills, 2004).

The most acceptable estimate was made by Hawksworth (2004) who considers the existence of more than 1.5 million fungal species, of which only 100.000 (7%) of the fungi have been described. A major part of the unknown taxa is supposed to be found in tropical regions, where the diversity of fungi higher than

in temperate areas (Piepenbring, 2007). The subject of this work is to expand the knowledge of the xylophilous Basidiomycetes.

Materials and Methods

Mondaí is located in the extreme west of the state of Santa Catarina (27°06'16"S and 53°24'07"W), southern Brazil, with a total land area of nearly 201km². The area was originally covered by Deciduous Seasonal Forest and the collections for this work were made in the remnants of these forest. Field trips were carried out between December/2005 and May/2007 at two locations in the Mondaí municipality: Linha Sanga Forte and Linha Uruguai, areas of six and seven acres, respectively. After collections, the basidiomata were taken to the Laboratório de Micologia (BOT/CCB/UFSC), where they were analyzed.

The basidiomata were studied macroscopically, including dimensions (size, length of tube and context), number of pores/mm, insertion in the substratum and color (Munsell, 1975). To study microscopic characteristics, the basidiomata were freehand sectioned and stained with 1% phloxine solution + 5% or 1% KOH solution (Ryvarden, 1991) and Melzer's reagent (Singer, 1975). Subsequently, microscopic characteristics, such as hyphae (types), cystidia and cystidioles, basidioles, basidia and basidiospores were measured under the light microscope (20 structure /slide) using a micrometric ocular lens. Illustrations were made with a camera lucida connected to the microscope. Data were compared with materials from FLOR, PACA, O, SP and ICN herbaria (Holmgren et al., 1990). Taxonomic arrangement followed Kirk et al. (2001).

Results and Discussion

This article provides keys to the identification of some taxa together with their geographical distribution in Brazil, comments, voucher material and illustrations of basidiospores (Figure 1) from each species.

AGARICALES Clem., 1909.

SCHIZOPHYLLACEAE Quél., 1888.

Schizophyllum commune (Fr.) Fr.

Systema Mycologicum 1: 330, 1821.

≡ *Schyzophyllum communis* Fr.,

Obs. Mycol. 1: 103, 1815.

Description in Cooke (1961).

Distribution: cosmopolitan, Brazil (AL, AP, PA, PB, PE, RN, RO, RS, SC, SP).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Uruguai, Campos-Santana & Santana 222, 23/V/2007 (FLOR).

Comments: This species is distinguished by whitish to buff color split lamellae; greyish or brownish, hirsute pilear surface with adhymenial hairs and thick context (Cooke, 1961), that make it easily recognizable in the field.

HYMENOCHAETALES Oberw., 1977.

HYMENOCHAETACEAE Imazeki & Toki, 1954.

Key

- | | |
|---|-------------------------------|
| 1 . Hyphal system monomitic..... | 2 |
| 1' . Hyphal system dimitic..... | 3 |
| 2 . Basidiomata resupinate, 2-3 pores per mm, spores 6-8 (9) × 4-5 (7)µm, basidia 18-20 × 6-7µm..... | |
| | <i>Inonotus</i> sp. |
| 2' . Basidiomata pileate sessile, spores measuring 5-7 × 3-4µm, basidia 12 × 5µm, pores 3-5 per mm..... | |
| | <i>Inonotus patouillardii</i> |
| 3 . Presence of hymenial setae..... | 4 |
| 3' . Absence of hymenial setae..... | 5 |
| 4 . Hymenial setae, 20-30 × 3-5µm, spores 5.5-7 × 5-6µm, ovoid to subglobose, golden-yellow to rusty brown..... | <i>Phellinus linteus</i> |
| 4' . Hymenial setae, 23-27 × 5-6µm, spores 3-4 × 2-3µm, ellipsoid to ovoid, hyaline..... | <i>Fuscoporia gilva</i> |
| 5 . Spores dextrinoid, cystidioid elements present | |
| | <i>Phellinus punctatus</i> |
| 5' . Spores non-dextrinoid, cystidioid elements absent | |
| | <i>Phellinus grenadensis</i> |

Inonotus sp.

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana & Santana 288, 25/V/2007 (FLOR).

Comments: The specimens agree with *Inonotus* Karsten's genera concept. However, the macroscopic and microscopical characteristics were not the same as previously described species available in literature, and it will be necessary to expand research on this taxon.

Inonotus patouillardii (Rick) Imazeki

Bulletin of the Tokyo Science Museum 6: 105, 1943.

≡ *Polystictus patouillardii* Rick., **Brotéria Bot.** 6: 89., 1907.

Description in Ryvarden (2005).

Distribution: pantropical, Brazil (RS, SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana & Santana 66, 14/IV/2006 (FLOR).

Comments: The hard, lustrous context and large conspicuous setal hyphae are diagnostic characteristics for *Inonotus patouillardii*. The hymenial setae do not appear frequently (Loguercio-Leite, 1990).

Fuscoporia gilva (Schw.: Fr.) T. Wagner et & M. Fischer

Mycologia 94: 1013, 2002.

≡ *Boletus gilvus* Schw., **Schrift Nat Ges Leipzig** 1:96, 1822.

Description in Ryvarden (2004).

Distribution: pantropical, Brazil (AL, AP, BA, MT, PA, PB, PE, PR, RS, RR, SC, SE, SP).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana & Santana 55, 15/IV/06 (FLOR).

Comments: *Fuscoporia gilva* (= *Phellinus gilvus* (Schwein) Pat.) is a very conspicuous species frequently collected in the tropics in open areas (Ryvarden, 2004). Macroscopically, it is similar to the species of *Inonotus* Karst. because of its annual and small basi-

diomata. This species is characterized by its abundant ventricose hymenial setae and small ellipsoid basidiospores.

Phellinus grenadensis (Murril) Ryvarden

Norw. J. Bot. 18: 234, 1972.

≡ *Pyropolyporus grenadensis* Murrill, **North Amer. Flora.** 9: 107, 1908.

Description in Larsen and Cobb-Pouille (1990).

Distribution: pantropical, Brazil (BA, PB, PR, RN, RS, SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Uruguai, Campos-Santana & Santana 239, 23/V/06 (FLOR).

Comments: The specimens are characterized at first by a fine velvety to tomentose rusty pilear surface, which become thick dark bay to black crustose after exposure, as well as showing distinct stratified tubes; without hymenial setae, thicker hyphae in the context and broadly elliptical to subglobose spores (Ryvarden, 2004).

Phellinus linteus (Berk. & M. A. Curtis) Teng.

Fungi of China :467, 1964.

≡ *Polyporus linteus* Berk. & M. A. Curtis, **Proc. Amer. Acad. Arts (Boston)** 4: 122, 1860.

Description in Ryvarden (2004).

Distribution: pantropical, Brazil (SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana, Santana & Zanella 123, 16/VI/06 (FLOR).

Comments: Diagnostic characteristics of this species are the pale golden brown spores, ovoid to subglobose spores and variably abundant setae (Ryvarden 2004). This species was previously recorded for Salto Veloso and Major Gercino, Santa Catarina, Brazil (Groposo et al., 2007).

Phellinus punctatus (Fr. ex P. Karst.) Pilát

Atlas Hub Europskych: 3 : 530, 1942.

≡ *Polyporus punctatus* Fr., **Hymenomyces Europaei**: 572, 1874.

Description in Ryvar den (2004).

Distribution: cosmopolitan, Brazil (AP, PR, SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana & Santana 292, 25/V/2007 (FLOR).

Comments: This species is recognizable in the field by the thick resupinate basidiomata that are often distinctly stratified; usually, it presents large globose dextrinoid spores, hyaline cystidioid elements and absence of setae.

POLYPORALES Gäum., 1926.

BOREOSTEREEACEAE Jülich, 1982.

Mycobonia flava (Fr.) Pat.

Bull. Soc. Myc. Fr. 10: 77, 1894.

≡ *Hirneola flava* Fr. **Syst. Orb. Veg.:** 93, 1825.

Description in Reid (1976).

Distribution: neotropical, Brazil (MG, RS, SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Uruguai, Campos-Santana, Santana & Souza-Rodrigues 188, 27/XII/06 (FLOR).

Comments: Some authors consider this species to be different from *Mycobonia brunneoleuca* (Berk. & M. A. Curtis) Pat. because its fusoid-ellipsoid basidiospores are smaller in width. The hyphal pegs at the hymenium, with subhymenial origin, are similar to those described by Corner (1984) and Reid (1976).

GANODERMATACEAE (Donk) Donk, 1948.

Key

- 1. Basidiomata pileate sessile, anamixodermic cutis *G. australe*
- 1'. Basidiomata centrally or laterally stipitate, hymenodermic cutis..... *G. lucidum*

Ganoderma australe (Fr.) Pat.

Bull. Soc. Mycol. France. 5: 67, 1889.

≡ *Polyporus australe* Fr., **Elench. Fung.** 1:108, 1828.

Description in Ryvar den (2004).

Distribution: pantropical, Brazil (BA, PR, RS, SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana, Santana & Souza-Rodrigues 25, 03/I/06 (FLOR).

Comments: This species is usually recognized due to its distinct black crust and dark brown pileus, tubes and context, as well as a dark line under its cutis. The cutis is anamixodermic, characteristic of what separates the species *G. australe* from *G. applanatum* (Pers.) Pat., which has a trichodermic cutis (Loguercio-Leite et al., 2005).

Ganoderma lucidum (Curtis: Fr.) P. Karst.

Rer. Mycol. 3: 17.1881.

≡ *Polyporus lucidus* W. Curtis: Fr. **Syst. Mycol.** 1: 353, 1821.

Description in Gilbertson and Ryvar den (1986).

Distribution: cosmopolitan, Brazil (RS, SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Uruguai, Campos-Santana, Santana & Zanella 138, 17/VI/06 (FLOR).

Comments: This species is very close to *G. resinaceum* Boudier, according to Gilbertson and Ryvar den (1986), who emphasize that *G. lucidum* (Curtis: Fr.) P. Karst. is distinguished by its characteristically stipitate basidiomata, its hymenodermic cutis and the size of its spores (globose and smaller than the ones in *G. resinaceum* Boudier).

MERIPILACEAE Jülich, 1982.

Key

- 1. Basidiomata pileate sessile, hymenophore orange, pores round to irregular, 3-6 per mm, spores subglobose to globose, 5-6 × 5-7 µm..... *R. ulmarius*
- 1'. Basidiomata pileate stipitate, hymenophore cream, pores round to irregular, 8-14 per mm, spores ellipsoid to drop-shaped, 4-5 × 3-4 µm..... *R. amazonicus*

Rigidoporus ulmarius (Sowerby ex. Fr.) Imazeki

Bull. Gout. Exp. Sta. Meguro 57: 119. 1952.

≡ *Polyporus ulmarius* Sowerby ex. Fr., **Syst. Mycol.** 1: 365. 1821.

Description in Ryvarden and Johansen (1980).

Distribution: cosmopolitan, Brazil (PR, RS, SC, SP).

Voucher material: Brazil, Santa Catarina, Mondai, Linha Uruguai, Campos-Santana & Santana 222, 23/V/2007 (FLOR).

Comments: Ryvarden and Johansen (1980) pointed out that this species has yellow to brownish yellow basidiomata of large size, globose to subglobose spores, and large and mammiform cystidioles among the basidia.

Rigidoporus amazonicus Ryvarden

Mycotaxon 28 (2): 537. 1987.

Description in Ryvarden (1987).

Distribution: Brazil (AM, SC).

Voucher material: Brazil, Santa Catarina, Mondai, Linha Uruguai, Campos-Santana & Santana 274, 25/V/2007 (FLOR).

Comments: When Ryvarden (1987) described *R. amazonicus* as a new species, he emphasized that it seemed to be a large specimen of *Rigidoporus biokoensis* (Lloyd) Ryvarden, which also has a lateral stipe. However, *R. biokoensis* is a smaller species and besides that it has a homogeneous context and bigger globose spores.

PODOSCYPHACEAE Reid, 1965.

Cymatoderma caperatum (Berkeley & Montagne) Reid

Kew Bulletin 10: 635, 1956.

≡ *Thelephora caperata* Berkeley & Montagne, **Annls Sci. nat. Bot.** 11: 241. 1849.

Description in Reid (1965).

Distribution: neotropical, Brazil (BA, MG, RS, SC, SP).

Voucher material: Brazil, Santa Catarina, Mondai, Linha Uruguai, Campos-Santana, Santana & Souza-Rodrigues 202, 27/VII/06 (FLOR).

Comments: This species has a well developed thick cuticular zone, similar in structure to *Cymatoderma*

blumei (Lév.) Reid. The differentiation between these two species is the absence of cystidia and spore size, larger in *C. caperatum* (Reid, 1965).

POLYPORACEAE Fr.: ex Corda, 1839.

Key

1. Spores and hyphae dextrinoid..... *Perenniporia martii*
- 1'. Spores and/or hyphae indextrinoid.....2
2. Basidiomata pileate stipitate, hymenophore lamellate *Stiptophyllum erubescens*
- 2'. Basidiomata pileate sessile, resupinate to effused-reflexed, poroid.....3
3. Presence of long black hairs in the pileus surface and basidiomata darkening in KOH..... *Hexagonia hydnoides*
- 3'. Absence of long black hairs in the pileus surface and basidiomata not darkening in KOH.....4
4. Basidiomata resupinate to effuse- reflexed, hyphal system dimitic..... *Trichaptum byssogenum*
- 4'. Basidiomata pileate sessile, hyphal system trimitic.....5
5. Context homogeneous, red-light to red-orange *Pycnoporus sanguineus*
- 5'. Context duplex, with other colors.....6
6. Hymenial surface poroid, pores regular, hexagonal, abhymenial surface velutinous.....7
- 6'. Hymenial surface poroid and lamellate, pores irregular, partly sinuous-daedaloid and radially split, partly lamellate, abhymenial surface villose to glabrous..... *Trametes elegans*
7. Basidiomata very thin, 0.2cm thick, tubes up to 0.15cm deep; spores 5-7 × 3-4 μm *Trametes villosa*
- 7'. Basidiomata rather thick, 0.9cm thick; tubes up to 0.4cm deep; spores 5-7 × 2-3 μm..... *Trametes socotrana*

Hexagonia hydnoides (Swartz) M. Fidalgo

Mem. New York Bot. Gard. 17 : 64, 1968.

≡ *Boletus hydnoides* Kwartz, **Fl. Ind. Occid.** 3: 1942, 1806.

Description in Gilbertson and Ryvarden (1986).

Distribution: pantropical, Brazil (AL, AM, BA, ES, MG, PA, PB, PE, PR, RN, SC, SE, SP).

Voucher material: Brazil, Santa Catarina, Mondai, Linha Sanga Forte, Campos-Santana, Santana & Souza-Rodrigues 02, 03/I/ 06 (FLOR).

Comments: The upper dark brown to almost black pilear surface, densely covered with long dark branched hairs, and the small spores are both diagnostic characteristics of this species (Loguercio-Leite, 1994), besides flesh darkening in KOH.

Perenniporia martii (Berk) Ryvarden

Norw. J. Bot. 19: 143. 1972.

≡ *Polyporus martius* Berk., **Hook. J. Bot.** 8: 198. 1956.

Description in Ryvarden and Johansen, 1980.

Distribution: pantropical, Brazil (AM, BA, PR, RS, SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Uruguai, Campos-Santana & Santana 245, 23/V/07 (FLOR).

Comments: This is a rare species that presents a wide tropical and subtropical distribution. It is microscopically distinct due to its pipshaped or tapering spores. The cystidia are more common in African and Asian specimens than in American specimens (Ryvarden and Johansen, 1980).

Pycnoporus sanguineus (L.: Fr.) Murril

Bull. Torrey Bot. Club. 31: 421, 1904.

≡ *Boletus sanguineus* L., *Species Pl.* 2: 1646, 1763.

Description in Nuñez and Ryvarden (2000).

Distribution: pantropical, Brazil (AL, AP, PA, PB, PR, PE, RJ, RN, RS, SC, SP).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana, Santana & Souza-Rodrigues 32, 03/I/06 (FLOR).

Comments: *Pycnoporus sanguineus* resembles *P. cinnabarinus* (Jacq.) P. Karst., but differs by having a thinner basidiomata, and smaller spores and basidia (Gilbertson and Ryvarden, 1987). The species can be found in fallen trunks, especially in open sunny forest areas.

Stiptophyllum erubescens (Berk.) Ryvarden

Norweg. J. Bot. 20: 4, 1973.

≡ *Daedalea erubescens* Berk. **Ann. Nat. Hist.** 4: 292, 1840.

Description in Ryvarden (1973).

Distribution: neotropical, Brazil (AM, BA, GO, MG, PA, PB, PR, RJ, RS, SC).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana & Santana 71, 14/IV/06 (FLOR).

Comments: Basidia and spores are present only in young basidiomata. However, in spite of the lack of spores and basidia in older specimens, the identification of this specimen is not in doubt. This species differs from *Xerotinus* Fr. by its trimitic hyphal system and from *Gloeophyllum* Karst. due to the presence of stipitate pileus and wood brown-rot (Wright and Deschamps, 1977).

Trametes elegans (Spreng.:Fr.) Fr.

Epicr. Syst. Mycol.:492, 1838.

≡ *Daedalea elegans* Spreng., **Sv. Vet. Akad. Handl.**: 51, 1820.

Description in Gilbertson and Ryvarden (1987).

Distribution: cosmopolitan, Brazil (PE, RO, SC, SP).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana, Santana & Souza-Rodrigues 29, 03/I/06 (FLOR).

Comments: The main feature that characterizes this species is an irregular hymenophore, with narrow lamellae or sinuous pores (Gilbertson and Ryvarden, 1987).

Trametes villosa (Fr.) Kreisel

Ciencias Biol. Ser. 4, 16: 84, 1971.

≡ *Polyporus villosus* Fr., **Sist. Mycol.** 1: 344, 1821.

Description in Loguercio-Leite (1993).

Distribution: pantropical, Brazil (AP, BA, PR, RS, SC, SP).

Voucher material: Brazil, Santa Catarina, Mondaí, Linha Sanga Forte, Campos-Santana, Santana & Souza-Rodrigues 03, 03/I/06 (FLOR).

Comments: This species is easily recognizable in the field for its very thin, coriaceous, hirsute and strongly concentrically zoned pilear surface, besides its large pores (1-3 per mm). The thickness of the basidiomata distinguish it from *Trametes versicolour* (L.:Fr.) Pilát, a close species that has thicker basidiomata, pores that

are often deep and smaller (3-5 per mm), and without black line between context and the tomentum (Loguercio-Leite 1993).

Trametes versicolor Cooke

Grevillea 11: 39, 1882.

Description in Loguercio-Leite (1993).

Distribution: pantropical, no Brazil (SC).

Voucher material: Brazil, Santa Catarina, Mondai, Linha Sanga Forte, Campos-Santana, Santana & Souza-Rodrigues 09, 03/I/06 (FLOR).

Comments: Loguercio-Leite (1993) stressed that this species is very similar to *Trametes hirsuta* (Wulf.: Fr.) Pil., but that it can be distinguished by the presence of cylindrical and thin spores and double context.

Trichaptum byssogenum (Jungh.) Ryvarden

Norwegian Journal of Botany 19: 237, 1972.

≡ *Polyporus byssogenus* Jungh., **Verh. Batav. Genootsch.** 17: 43, 1838.

Description in Nuñez and Ryvarden (2001).

Distribution: pantropical, Brazil (AM, BA, RO, SC, SP).

Voucher material: Brazil, Santa Catarina, Mondai, Linha Sanga Forte, Campos-Santana, Santana & Zanella 102, 16/VI/06 (FLOR).

Comments: It is easily recognizable in the field by its moderately coarse greyish to pale brownish tomentum and, flexible consistency (Gilbertson and Ryvarden, 1987).

The inventory of xylophilous Basidiomycetes, carried out at two locations in the Mondai municipality (Linha Sanga Forte and Linha Uruguai) resulted in the identification of 21 species, all of which are new records. Polyporaceae was the best-represented family with eight species, followed by Hymenochaetaceae with six species. Most specimens collected belong to two species: *Trametes villosa* (Fr.) Kreisel (13) and *Stiptophyllum erubescens* (Berk.) Ryvarden (5), which is the only wood brown-rot species.

The current data demonstrates that it is necessary to continue with cumulative taxonomic efforts to reinforce the knowledge about mycodiversity, mainly in tropical areas.

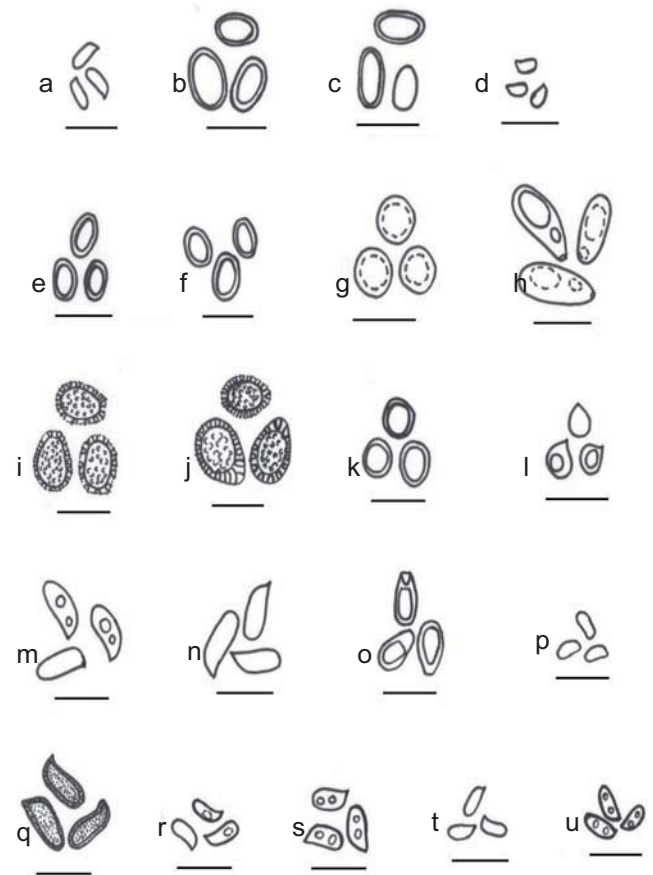


FIGURE 1: Spores of species **a)** *Schizophyllum commune*; **b)** *Inonotus* sp.; **c)** *Inonotus patouillardii*; **d)** *Fuscoporia gilva*; **e)** *Phellinus grenadensis*; **f)** *Phellinus linteus*; **g)** *Phellinus punctatus*; **h)** *Mycobonia flava*; **i)** *Ganoderma australe*; **j)** *Ganoderma lucidum*; **k)** *Rigidoporus ulmarius* **l)** *Rigidoporus amazonicus*; **m)** *Cymatoderma caperatum*; **n)** *Hexagonia hydroides*; **o)** *Perenniporia martius*; **p)** *Pycnoporus sanguineus*; **q)** *Stiptophyllum erubescens*; **r)** *Trametes elegans*; **s)** *Trametes villosa*; **t)** *Trametes socotrana*; **u)** *Trichaptum byssogenum*. Scale = 10µm.

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