

The genus *Laetiporus* in Brazil

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Introduction

Traditionally, the genus *Laetiporus* was composed of only two species: *L. sulphureus* (Bull.) Murrill and *L. persicinus* (Berk. & M.A. Curtis) Gilb. (1). Both very distinct in color and habit of grow but similar microscopically (dimitic and simple septa hyphae) and ecologically (brown rot fungus).

In the 90's, a study on mating and molecular biology showed that *L. sulphureus* was a taxon hiding cryptic species sharing similar morphological traits but different ecological and geographical distribution (2).

Subsequently studies on molecular biology of *L. sulphureus* worldwide started a revolution in the taxonomy of *Laetiporus* genus, with dozens of species been described (3-9).

In Brazil three species of *Laetiporus* are registered. *L. sulphureus*, *L. persicinus* and *L. squalidus* R. Pires, Motato-Vásquez & Gugliotta (7).

Material and Methods

New collections were made in the Atlantic Forest biome and herbaria collections were reviewed. Specimens were described macroscopically and microscopically using traditional methods, pictures and notes on ecological traits were taken, fresh materials were cultured and all collections had their DNA extracted, ITS, LSU and *tef1- α* sequences were amplified (10-12).

Results

Forty-two specimens were studied, which 23 were new collections, including new hosts registration for them. Forty-two sequences of DNA were amplified (ITS: 16; LSU: 11; and *tef1- α* : 15). We confirmed three morphotypes occurring in Brazil as described next:

***Laetiporus gilbertsonii* (n=29)**

Basidiomata seasonal, pileated, attached to host by a small pseudostipe (up to 30cm diameter; 9 to 16cm long; 1,5 to 3cm thick). Pileus soft, orange to yellow. Context homogenous white (15-20cm at base). Pore surface yellow citric, pores rounded tubes concolorous with pore surface (1,5mm thick and 3-4 pores/mm). Hyphal system trimitic, with generative hyphae simple septa (9-11 μ m) and

dissolving in KOH 5% binding-hyphae richly branched (5-12 μ m) on context and generative hyphae simple septa thin walled (4-6 μ m) and straight skeletal hyphae thick walled (5-7 μ m) on tubes. Basidia clavate (20 x 5-6 μ m), hyaline, 4-sterigmated. Basidiospores ellipsoid to broadly ellipsoid (5,0-7,0 x 4,0-5,0 μ m), hyaline, smooth, slightly thin-walled, inamyloid, undextrinoid. Ecological notes: all of them were collecting growing on *Eucalyptus* sp., *Pleuroma granulosa* (Desr.) Don. and *Myrciaeugenia* sp., last two are new host for *Laetiporus* genus.



Figure 1. Laetiporus gilbertsonii morphotype. A: Basidiome growing on *Pleuroma granulosa* (Desr.) Don. (CATO 229, São Paulo/Brazil); B: Context and tubes; C: Skeletal binding-hyphae on context; D: Hymenium with basidia; E: Basidiospores.

***Laetiporus squalidus* (n=2)**

Basidiomata seasonal (10-15cm diameter), resupinate forming narrow and small imbricated pilei (0,5-2,5cm diameter; 1,0-2,0cm long; 0,4-1,0cm thick), soft when

fresh to chalky when dry. Pileus amorphous, broadly attached, cream to pale brown when fresh and light ochraceous when dried. Margin irregular. Context homogeneous and concolorous. Pore surface cream when fresh to brown when dry, pores rounded and decurrent (3-4 pores/mm), tubes concolorous with pore surface (0,3-1,0cm), dissepiments entire, thin to slightly thick. Hyphal system dimitic with generative hyphae simple septa (4,0-70 μ m) and skeletal-binding hyphae (5,5-7,0 μ m) branched on apex in the context. Also in context we observed gloeohyphae rarely branched and simple septate (120-350 μ m long; 10-25 μ m large). In tubes, generative hyphae simple septa (4,0-7,0 μ m), skeletal hyphae straight and thick walled (4,0-6,0 μ m) projecting skeletal-cystidia through hymenium (30-70 x 5-7 μ m, thick walled: 3,0 μ m). Basidia clavate (16-20 μ m), hyaline, 4-sterigmate. Basidiospores ellipsoid (5,0-7,0 x 4,0-5,0 μ m), hyaline, smooth, slightly thick-walled, inamyloid, undextrinoid. New collection extended species distribution and registered identification of host tree *Schinus engleri* F.A. Barkley.

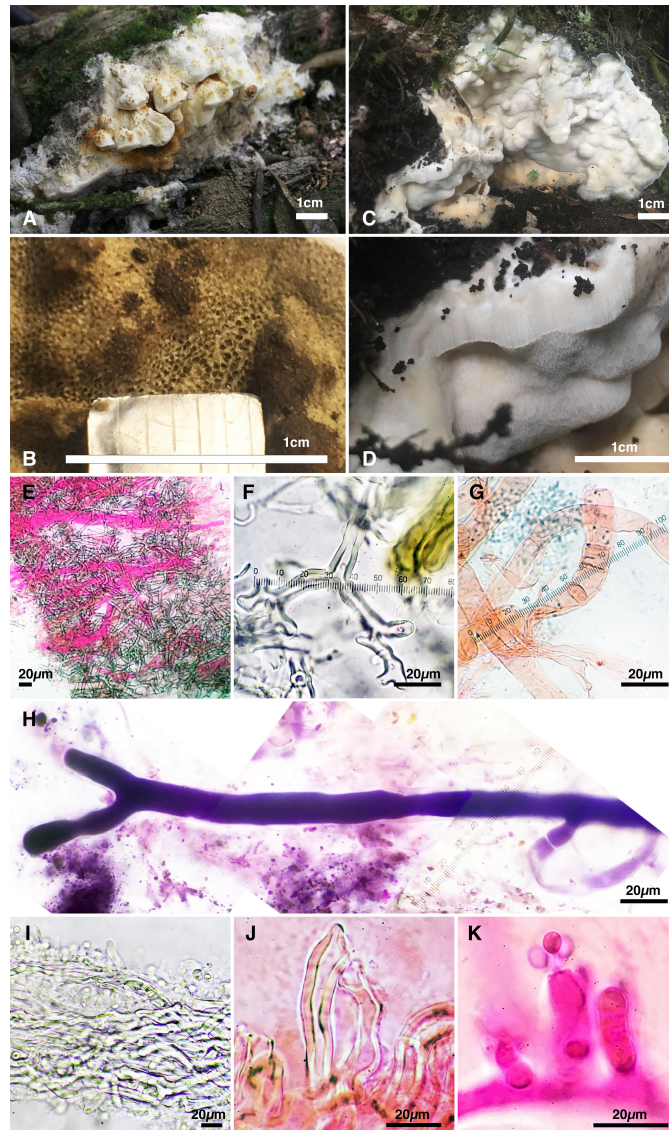


Figure 2. *L. squalidus* morphotype. A: Fresh holotype basidiome reviewed on this study (SP 466047, São Luiz do Paraitinga, Brazil); B: Dried holotype pore surface; C: Basidiome of new collection growing on *Schinus engleri* F.A. Barkley

(FLOR 67251, Urubici, Brazil); D: Fresh specimen context and pore surface. E: Context with stained gloeohyphae; F: Skeletal-binding hyphae on context; G: Generative hyphae simple septa; H: Entire gloeohyphae cresyl blue stained; I: Hyphael system of tubes; J: Skeletal-cystidia projecting through hymenium; K: Basidia and basidiospores.

***Kusaghiporia* sp. (n=11)**

Very big seasonal basidiomata forming a circular rosette (30-80cm diameter; 7cm thick), attached to plant host on the roots with a robust stipe (5-10cm diameter; 10-15cm long). Pileus soft when fresh to hard when dry, center black, becoming brownish to white on the margin. Context white becoming brownish when cut with black lines showing lines of growing. Pore surface white becoming brown when touched discolor with context, pores round (5-10 pores/mm), tubes (1-3mm) concolours with pore surface. Hyphal system dimitic with generative hyphae simple septa (10-15 μ m) and skeletal hyphae with bifurcated branches (7-10 μ m) thick walled (1-2 μ m), gloeohyphae with granular yellow-brownish contente (10-15 μ m). Generative hyphae simple septa (4-5 μ m) thin walled with capitated apex in hymenium. Basidia straight (18-24 μ m), hialine 4-sterigmated, basidiospores globose to subglobose, hyaline, smooth, thick-walled, inamyloid, undextrinoid (6-7,5x5-7 μ m).

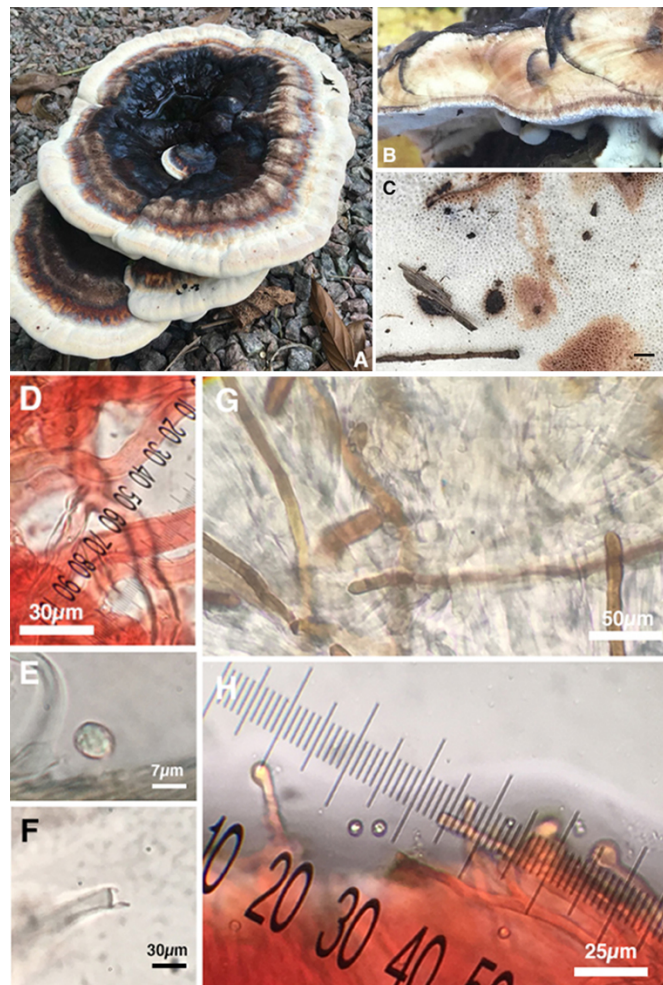


Figure 3. *Kusaghiporia* sp. A: Basidiome growing on the ground; B: Context and pore layer; C: Pore surface, changing color when bruised; D: Skeletal-binding

hyphae bifurcated branching; E: Basidiospore; F: Basidia; G: Gloeohyphae with granular content; H: Generative hyphae with capitated apex.

Conclusions

We found that *L. sulphureus* (Bull.) Murrill doesn't occur in Brazil, previous collections determined as *L. sulphureus* are more related with *L. gilbertsonii* Burds. that grows on Eucalyptus sp. Some species were found growing on native trees and molecular biology could reveal that Brazilian species are a new to science.

New collection and review of type specimen of *L. squalidus* revealed that probably we aren't dealing with a species of *Laetiporus* genus and taxon should be treated taxonomic giving it a new combination in a new genus.

Those specimens usually identified as *L. persicinus* (Berk. & M.A. Curtis) Gilb. in Brazil correspond to recently described genus from Africa named *Kusaghiporia* (13). Collections from Brazil are very similar to those described as *Polyporus talpae* Cooke and its synonym *Meripilus talpae* (Cooke) D.A. Reid.

Bibliography

1. Gilbertson, R. L. North American wood-rotting fungi that cause brown rots. *Mycotaxon* 12, 372–416 (1981).
2. Banik, M. T., Burdsall, H. H. & Volk, T. J. Identification of groups within *Laetiporus sulphureus* in the United States based on RFLP analysis of the nuclear ribosomal DNA. 33, 9–14 (1998).
3. Banik, M. T., Lindner, D. L., Ortiz-Santana, B. & Lodge, D. J. A new species of *Laetiporus* (Basidiomycota, Polyporales) from the Caribbean basin. *Tomo Kurtziana* 37, 15–21 (2012).
4. Kout, J., Vlasak, J., Lindner, D. L., Banik, M. T. *Laetiporus lobatus* (Basidiomycota, Polyporales), a new fungal species from Costa Rica. *Phytotaxa* 408, 208–214 (2019).
5. Lindner, D. L. & Banik, M. T. Molecular phylogeny of *Laetiporus* and other brown rot polypore genera in North America. *Mycologia* 100, 417–430 (2008).
6. Ota, Y. et al. The genus *Laetiporus* (Basidiomycota, Polyporales) in East Asia. *Mycol. Res.* 113, 1283–1300 (2009).
7. Pires, R. M., Motato-Vásquez, V. & de Mello Gugliotta, A. A new species of *Laetiporus* (Basidiomycota) and occurrence of *L. gilbertsonii* Burds. in Brazil. *Nov. Hedwigia* 102, 477–490 (2016).
8. Song, J., Chen, Y., Cui, B., Liu, H. & Wang, Y. Morphological and molecular evidence for two new species of *Laetiporus* (Basidiomycota, Polyporales) from southwestern China. *Mycologia* 106, 1039–1050 (2014).
9. Song, J. & Cui, B.-K. Phylogeny, divergence time and historical biogeography of *Laetiporus* (Basidiomycota, Polyporales). *BMC Evol. Biol.* 17, 102 (2017).

10. Hugenholtz, P. & Pace, N. Identifying microbial diversity in the natural environment: A molecular phylogenetic approach. *Trends Biotechnol.* 14, 190–197 (1996).
11. Lodge, D. J., Ammirati, J. F., O'Dell, T. E. & Mueller, G. M. Collecting and describing macrofungi. *Biodivers. fungi Invent. Monit. methods.* Amsterdam Elsevier Acad. Press. 2004 Pages 128-158. (2004).
12. Teixeira, A. Método para estudo das hifas do basidiocarpo de fungos poliporáceos. (Instituto de Botânica, 1995).
13. Hussein, J., Tibuwaha, D. & Tibell, S. Phylogenetic position and taxonomy of *Kusaghiporia usambarensis* gen. et sp. nov. (Polyporales). *Mycology.* 9(2), 136-144 (2018).