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Original Paper

New anamorphic species of Pucciniales (Fungi, Basidiomycota) collected in the Itatiaia National Park, Brazil

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Abstract

Eight new anamorphic species of Pucciniales belonging to the genera *Aecidium*, *Caeoma*, *Malupa*, *Milesia*, *Physopella* and *Uredo* are proposed. The new species were collected in the Itatiaia National Park in the states of Minas Gerais and Rio de Janeiro, Brazil, on the plant families Annonaceae, Apocynaceae, Euphorbiaceae, Menispermaceae, Salicaceae, Solanaceae and Verbenaceae.

Key words: biodiversity, Minas Gerais, Rio de Janeiro, rust fungi, Uredinales.

Resumo

Oito novas espécies anamorficas de Pucciniales pertencentes aos gêneros *Aecidium*, *Caeoma*, *Malupa*, *Milesia*, *Physopella* e *Uredo* são propostos. As novas espécies foram coletadas no Parque Nacional do Itatiaia nos estados de Minas Gerais e Rio de Janeiro, Brasil, crescendo sobre espécimes das famílias botânicas Annonaceae, Apocynaceae, Euphorbiaceae, Menispermaceae, Salicaceae, Solanaceae e Verbenaceae.

Palavras-chave: biodiversidade, Minas Gerais, Rio de Janeiro, ferrugens, Uredinales.

Introduction

The Itatiaia National Park is located in the Mantiqueira Mountains, near the cities of Itatiaia and Resende in Rio de Janeiro state, and near Itamonte and Bocaina de Minas in Minas Gerais state, in the Atlantic Rainforest domain (ICMBIO 2014). Rainfall and temperature gradients and the historical colonization of plants reflect the altitudinal and microclimatic factors influencing regional biodiversity and endemism (Safford 1999).

According to Salazar & Carvalho (2009, 2010a,b, 2012, 2014), the Pucciniales (rust fungi) biota in the Itatiaia National Park is composed of 192 species growing on 60 botanical families, with Asteraceae, Fabaceae, and Poaceae being the most diverse host species. Those same authors reported a new teleomorphic genus, 4 new teleomorphic species, and 9 new species occurrences in Brazil.

We present here eight new anamorphic species of Pucciniales from Brazil that were collected during the project "Uredobiota (fungi) of the Itatiaia National Park".

Materials and Methods

Treatment of collected materials follows Cummins & Hiratsuka (2003): samples of host plants with rust fungi symptoms and signs were collected in the Itatiaia National Park (Parque Nacional do Itatiaia). The material was herborized and taken to the Mycology Laboratory at the Rio de Janeiro Botanical Garden. The symptoms and signs were observed and recorded, and slides prepared by the scraping and cutting the samples in lactophenol and chloral hydrate while viewing under a Leica S6E stereomicroscope. A Zeiss "Axioskop 40" microscope was used to observe the rust structures, and a coupled Zeiss "Axiocam MRc" camera was

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used for image capturing and spore measurements with Axiovision Rel. 4.6 program software. The rusts were identified by their morphological characteristics, host range, and by consulting the specialized literature (Order Pucciniales).

Results and Discussion

Were found eight new anamorphic Pucciniales species on host plants in the families Annonaceae, Apocynaceae, Euphorbiaceae, Menispermaceae, Salicaceae, Solanaceae, and Verbenaceae. Their descriptions are presented as follows:

1. ***Aecidium aspidospermatis*** Salazar & A.A. Carvalho *sp. nov.*
MycoBank: MB826691
Type: BRAZIL. MINAS GERAIS: Itamonte, on *Aspidosperma* sp. (Apocynaceae), na trilha vale Santa Clara - Campos de altitude, 22º19.290'S, 44º37.297'W, 1,615 m altitude, 14.VII.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 443-07* (Holotype RB480620!, Isotype MMUNM, MB826691). Fig. 1a-e

Spermogonia on adaxial side of the leaves. Inner wall of peridium verrucose-striated, outer wall smooth. Aecia (*Aecidium* type), aeciospores wall verrucose, 1–2 µm of uniform thickness.

Etymology: After *Aspidorperma*, the host genus.

Spermogonia of group V (type 4), on adaxial side of leaves, abundant, systemic, in chlorotic areas along the nervure, or rounded, up to 1 cm in diameter, pale yellow at the base and cinnamon-brown at the apex. Aecia (*Aecidium* type) on abaxial side of leaves, associated with spermogonia, grouped, cupulate, 275–350 × 235–275 µm, from white to pale yellow, cells rhomboid, rectangular, variable in shape and size, 27–39 × 18–24 µm, inner wall verrucose-striated, outer wall smooth, colorless; aeciospores highly variable, generally polyhedral, 15–27 µm in diameter, wall verrucose, 1–2 µm of uniform thickness, colorless.

Additional specimens examined (Paratypes): BRAZIL. MINAS GERAIS: Bocaina de Minas, *Aspidosperma* sp. (Apocynaceae), trilha Cachoeira do Escorrega, Campos de Altitude, 22º21.225'S, 44º37.233'W, 1,862 m altitude, 15.II.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 94-07* (RB480649!). RIO DE JANEIRO: Itatiaia, entrada da trilha Rio Campo Belo - Prateleiras (trilha Ruy Braga), 22º25.747'S, 44º37.627'W, 1,400 m altitude, 5.XII.2006, *M. Salazar Yepes & A.A. Carvalho Jr. 465-06* (RB480623!); entrada da trilha Três Picos, 22º26.136'S, 44º36.547'W, 1,100 m altitude, 15.II.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 112-07* (RB480580!); trilha Três Picos, 22º25.315'S, 44º35.446'W, 1,545 m altitude, 7.VIII.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 509-07* (RB480629!).

Sydow & Sydow (1924) described nine species of *Aecidium* parasitizing the Apocynaceae family. Among them, five species were recorded for the American continent, none of them on the genus *Aspidosperma*. In Brazil, Hennen *et al*. (2005) recorded only *Aecidium ochraceum* Speg. on the host genus *Tabernaemontana* spp. Salazar & Carvalho (2010b) recorded *A. ochraceum* and its spermogonia for the first time in the Itatiaia National Park. *A. ochraceum* is very close to the new species, but differs by having spermogonia on both sides of the leaves (mainly on adaxial face), inner walls of the peridium with large verrucae, and outer walls of the peridium with diminutive verrucae. Additionally, the walls of the aeciospores are finely verrucose, 6–12 µm thick at apex. *A. aspidospermatis* differs from the other four species present on the American continent by the following: *A. apocyni* Schwein. (USA) shows spermogonia on both sides of the leaves, inner peridial cells verrucose, outer peridial cells striated, and aeciospores walls finely verrucose; spermogonia not known in *A. leporidium* Arthur (Mexico) (uredinia of the *Aecidium* type), inner and outer cells of the peridium are verrucose, and urediniospore walls are finely verrucose, without uniform thicknesses; spermogonia are also unknown in *A. aegeridae* Arthur (Mexico) (uredinia of the *Aecidium* type), urediniospores sub-hyaline with finely verrucose walls, without uniform thicknesses; *A. thevetiae* Sacc. (Mexico) also with unknown spermogonia, inner peridial cells verrucose, outer peridial cells striated, and urediniospores sub-hyaline with thin verrucose walls without uniform thicknesses.

The species is distributed in Brazil , and its life cycle is unknown.

2. ***Aecidium disciphaniae*** Salazar & A.A. Carvalho *sp. nov.*
MycoBank: MB826692
Type: BRAZIL. RIO DE JANEIRO: Itatiaia, on *Disciphania* sp. (Menispermaceae), entrada da trilha Três Picos, 22º26.136'S, 44º36.547'W, 1,100 m altitude, 16.II.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 114-07* (Holotype RB480582!, Isotype MMUNM). Fig. 1f-j

Spermogonia on adaxial side of leaves. Aecia (*Aecidium* type), peridial cells rectangular or rhomboid, 30–45 × 18–21 µm. Aeciospores 18–33 µm in diameter, walls verrucose.

Etymology: After *Disciphania*, the host genus.

Spermogonia on adaxial side of leaves, Group V (Type 4), in groups, in rounded chlorotic areas, 5–15 mm diameter, cinnamon-brown to black. Aecia (*Aecidium* type), sori on abaxial face of leaves, densely grouped, rounded, associated with spermogonia, cupulate, 250–300 × 200–250 µm, pale yellow, peridial cells rectangular or rhomboid, 30–45 × 18–21 µm; walls verrucose, colorless; aeciospores ellipsoids, oblong-ellipsoids or angular, 18–33 µm in diameter, walls verrucose, 1–2 µm thick, colorless.

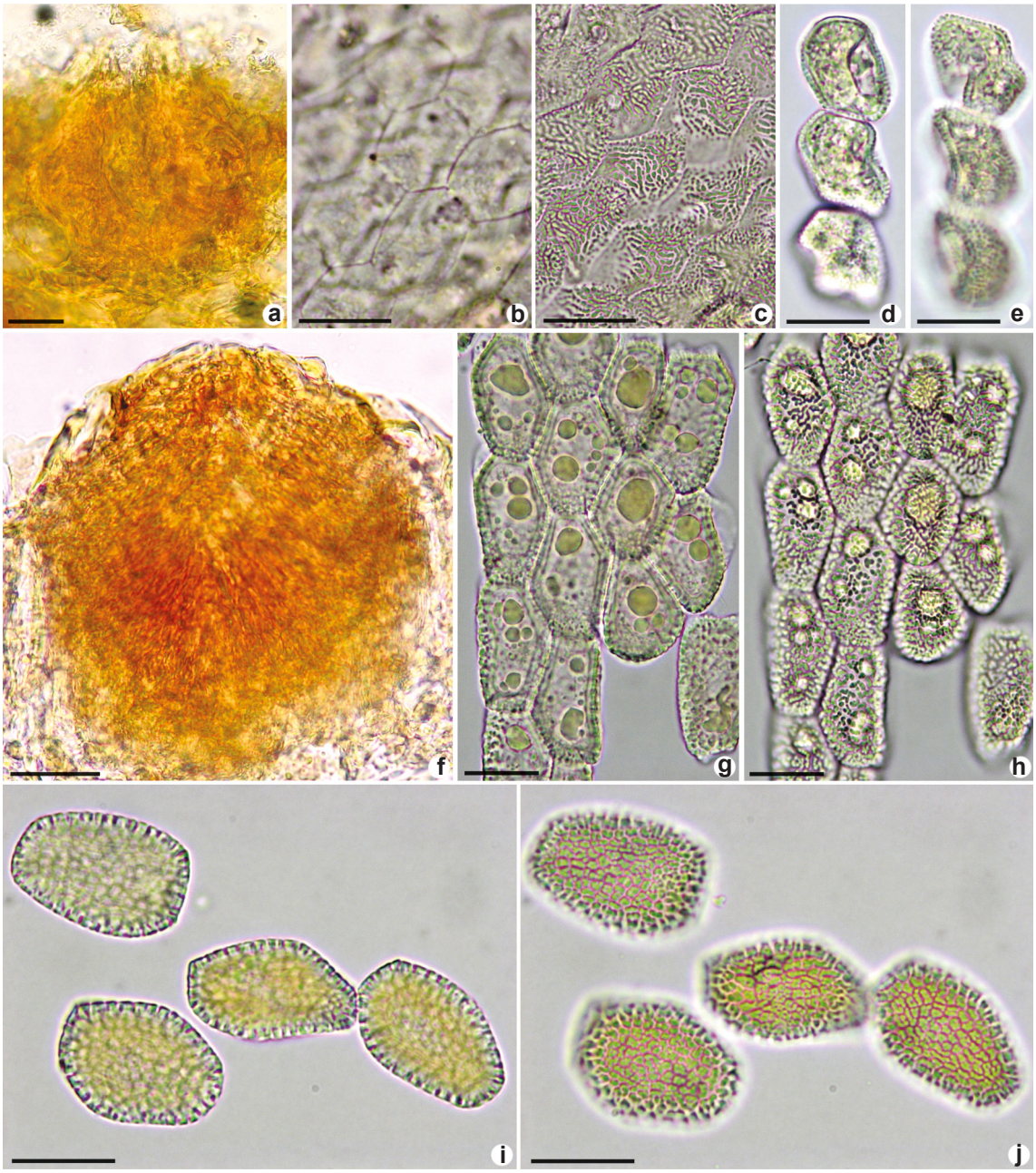

Figure 1 – a-e. *Aecidium aspidospermatis* – a. spermogonia; b-c. peridium cells – b. median focus; c. surface focus; d-e. aeciospores – d. median focus; e. surface focus. f-j. *Aecidium disciphaniae* – f. spermogonia; g-h. peridium cells – g. median focus; h. surface focus; i-j. aeciospores – i. median focus; j. surface focus. Bars: a,f = 50 µm; b-e = 20 µm; g-j = 20 µm.

Additional specimens examined (Paratypes): BRAZIL. MINAS GERAIS: Itamonte, on *Disciphania* sp. (Menispermaceae), ao redor da Garganta do Registro, 22º22.558'S, 44º45.627'W, 1,670 m altitude, 20.II.2008, *M. Salazar Yepes & A.A. Carvalho Jr. 50-08* (RB480629!); trilha Vale Santa Clara, Alto dos Brejos, 22º18.022'S, 44º36.159'W, 1,515 m altitude, 21.II.2008, *M. Salazar Yepes & A.A. Carvalho Jr. 101-08* (RB480576!). RIO DE JANEIRO: Itatiaia, ao redor do Hotel Donati, 22º26.491'S, 44º36.053'W, 1,010 m altitude, 22.II.2008, *M. Salazar Yepes & A.A. Carvalho Jr. 113-08* (RB480581!).

The differences between *A. disciphaniae* and *A. usterianum* Speg. (the only other species reported growing on Menispermaceae and collected in São Paulo state, Brazil) (Spegazzini 1908) are the absence, in *A. usterianum*, of spermogonia, smaller peridium cells (up to 35 µm), and aeciospores smaller and with smooth walls.

The species is distributed in Brazil, and its life cycle is unknown.

3. *Caeoma sapium* Salazar & A.A. Carvalho *sp. nov.*

MycoBank: MB826693

Type: BRAZIL. RIO DE JANEIRO: Itatiaia, on *Sapium* sp. (Euphorbiaceae): estrada para o Hotel Donati, 22º26.680'S, 44º36.550'W, 955 m altitude, 7.XII.2006, *M. Salazar Yepes & A.A. Carvalho Jr. 501-06* (Holotype RB480628!, Isotype MMUNM). Fig. 2a-d

Spermogonia on both sides of leaves, numerous, associated with aecia; aecia (*Caeoma* type), aeciospores catenulate, walls verrucose, 1–1.5 µm thick.

Etymology: After *Sapium*, the host genus.

Spermogonia on both sides of leaves, numerous, on rounded necrotic areas of the leaves, 1–2 mm in diameter, associated with aecia, pale cinnamon-brown to cinnamon-brown. Aecia (*Caeoma* type) on adaxial face of leaves, grouped, surrounding the spermogonia, confluent, conspicuously rupturing the epidermis, powdery, pale yellow; aeciospores catenulate, oblong-ellipsoids or angular, 24–30 × 21–24 µm; walls verrucose, 1–1.5 µm thick, golden-yellow; germ pores 3, equatorial.

Two rust species were recorded by Sydow & Sydow (1910) parasitizing the genera *Sapium* (Euphorbiaceae): the first, *Uromyces globosus* Dietel & Holway has a microcyclic life cycle; the second, *Uromyces cisneroanus* Speg., has only uredinia and telia known. The new species, *C. sapium*, has numerous spermogonia associated with the aecia. That stage shows non-pedicellate and verrucose aeciospores.

As the sample collected in the Itatiaia National Park does not show any features that could be a complement of the life cycle of *U. cisneroanus*, we consider it a new anamorphic species.

The species is distributed in Brazil, and its life cycle is unknown.

4. *Malupa dyssochromatis* Salazar & A.A. Carvalho *sp. nov.*

MycoBank: MB826694

Type: BRAZIL. RIO DE JANEIRO: Itatiaia, on *Dyssochroma viridiflora* (Sims) Miers (Solanaceae): entrada da trilha Rio Campo Belo-Prateleiras (trilha Ruy Braga), 22º25.711'S, 44º37.186'W, 1,145 m altitude, 19.X.2006, *M. Salazar Yepes*, *A.A. Carvalho Jr. & C.M. Sakuragui 336-06* (Holotype RB480604!, Isotype MMUNM, MB826694). Fig. 2e-h

Uredinia (*Malupa* type) on abaxial face of the leaves; paraphyses cylindrical, surrounding the sori on the hymenium, colorless; urediniospores 30–51 × 21–27 µm; germ pores 2–4, equatorial.

Etymology: After *Dyssochroma*, the host genus.

Uredinia (*Malupa* type) on abaxial face of the leaves, solitary or grouped, 250–800 µm in diameter, subepidermal in origin, covered by the epidermis, opening by a central pore, cinnamon-brown; hymenium curved; paraphyses cylindrical, surrounding the sori on the hymenium, up to 60 µm long, colorless; urediniospores obovoid, piriform, 30–51 × 21–27 µm; walls thin, echinulate, and uniformly arranged, 1–2 mm thick, pale yellow; germ pores 2–4, equatorial.

Additional specimens analyzed (Paratypes): BRAZIL. RIO DE JANEIRO: Itatiaia, on *Dyssochroma viridiflora* (Sims) Miers, ao redor da ponte sobre o Rio Campo Belo, 22º25.685'S, 44º37.159'W, 1,109 m altitude, 19.X.2006, *M. Salazar Yepes*, *A.A. Carvalho Jr. & C.M. Sakuragui 339-06* (RB480605!); 06.VIII.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 460-07* (RB480622!); 8.X.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 588-07* (RB480635!); trilha Três Picos, 22º25.315'S, 44º35.446'W, 1,545 m altitude, 7.VIII.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 508-07* (RB480630!); 9.X.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 608-07* (RB480637!).

It is uncommon to find the rust family Phakopsoraceae parasitizing the plant family Solanaceae in the neotropics. Only *Crossopsora uleana* (Sydow & P. Sydow) Peterson has been recorded parasitizing the genera *Cyphomandra* and *Solanum* in Brazil, Colombia, and Ecuador

(Buriticá 1999b; Hennen *et al.* 2005). But *C. uleana* differs by having flexed and pale yellow paraphyses and smaller urediniospores (up to 30 µm) and 3 supra-equatorial germ pores.

This is the first record of a rust on the host *Dyssochroma viridiflora* Miers, a native Brazilian plant.

The species is distributed in Brazil, and its life cycle is unknown.

5. *Milesia crotonis-salutaris* Salazar & A.A. Carvalho *sp. nov.*
MycoBank: MB826695

Type: BRAZIL. RIO DE JANEIRO: Itatiaia, on *Croton salutaris* Casar. (Euphorbiaceae), ao redor da ponte sobre o Rio Campo Belo, 22º25.685'S, 44º37.159'W, 1,109 m altitude, 14.VIII.2006, *M. Salazar Yepes, A.A. Carvalho Jr. & I. França 96-06* (Holotype RB480650!, Isotype MMUNM).

Fig. 2i-l

Spermogonia unknown; uredinia (*Milesia* type); paraphyses in the hymenia, abundant, small, walls thin and cinnamon-brown; urediniospores golden-yellow, echinulate, echinulae up to 2.5 µm long, few and irregularly arranged, wall thick (1–5 µm); germ pores not seen.

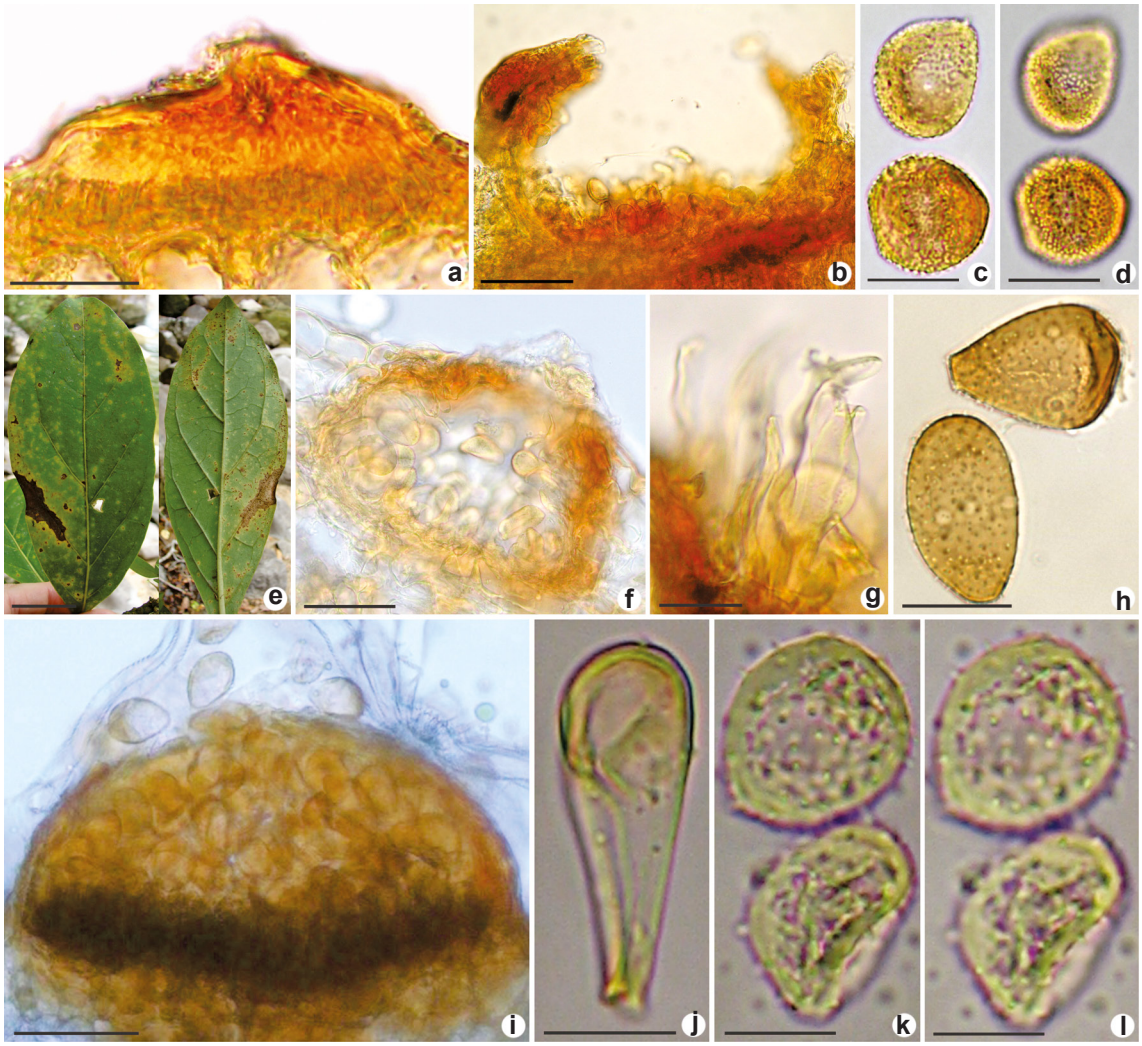

Figure 2 – a-d. *Caeoma sapium* – a. spermogonia; b. aeciosori; c-d. aeciospores – c. median focus; d. surface focus. e-h. *Malupa dyssochromatis* – e. symptoms on adaxial (left) and on abaxial face of leaves (right); f. general view of uredinia; g. paraphyses; h. urediniospores. i-l. *Milesia crotonis-salutaris* – i. general view of uredinia; j. paraphyse; k-l. urediniospores – k. median focus; l. surface focus. Bars: a = 500 µm; e = 2 cm; i = 50 µm; b,f = 100 µm; c-d, g-h = 20 µm; j-l = 10 µm.

Etymology: After *Croton salutares*, the host genus.

Spermogonia unknown. Uredinia (*Milesia* type), on abaxial face of leaves, solitary or grouped, small, conspicuously rupturing the epidermis, cinnamon-brown; hymenia subepidermal and planar; peridia hyphoid, persistent, golden yellow; paraphyses in the hymenia, abundant, small, up to 24 µm long, walls thin and cinnamon-brown; urediniospores sessile obovoid, ellipsoids, 24–30 × 15–21 µm; wall echinulate, lateral wall thick (1–5 µm), and apical wall thick (2–6 µm), golden-yellow, echinulae up to 2.5 µm long, few and irregularly arranged; germ pores not seen.

Additional specimens examined (Paratypes): BRAZIL. RIO DE JANEIRO: Itatiaia, on *Croton salutaris* Casar, ao redor da ponte sobre o Rio Campo Belo, 22º25.685'S, 44º37.159'W, 1,109 m altitude, 19.X.2006, *M. Salazar Yepes*, *A.A. Carvalho Jr. & C.M. Sakuragui 340-06* (RB480607!); trilha Cachoeiras Véu de Noiva-Itaporani, 1,180 m altitude, 23.IV.2007, *M. Salazar Yepes*, *A.A. Carvalho Jr. & F. Santoro 209-07* (RB480592!).

Buriticá (1998, 1999a) recorded 10 Pucciniales species of the genera *Arthuria*, *Milesia* and *Phakopsora* on *Croton* hosts in the neotropics. *Arthuria* comprises four species: *A. catenulata* Jackson & Holway, *A. columbiana* (Kern & Whetzel) Cummins, *A. demicicla* Buriticá & Hennen, and *A. micra* Buriticá & Hennen, all with an *Aeciure*-type, anamorph genus different from *Milesia* that we are suggested here.

Two species of *Milesia* were published as new combinations by Buriticá (1999a). *M. valentula* (Jackson & Holway) Buriticá & Hennen differs from the new specie by having spermogonia, no paraphyses (neither Jackson 1931, nor Buriticá 1999a, described paraphyses) and also has urediniospores with 3 supraequatorial germ pores. *M. venezuelanae* (Kern & Thurston) Buriticá & Hennen also differs by having spermogonia, no paraphyses, and spores yellow-brown.

The four species of the genus *Phakopsora* recorded here also show anamorphs as in *Milesia*, which suggests that the new species is more closely related to that rust group. *P. argentinensis* differs from the new species by having few and colorless paraphyses, urediniospores with many and short echinulae, as well as walls only 1–1.5 µm thick. *P. crotonis* (Burrill) Arthur is similar to the new species but has spermogonia, few and colorless paraphyses up to 1.5 µm thick on the dorsal face and apex and urediniospores, with many and short echinulae, walls 0.5–1.5 µm thick, and 4 germ pores. *P. mexicana* (Arthur) Arthur and *P. pavida* Buriticá & Hennen are similar to *M. crotonis-salutaris*, but *P. mexicana* has a non-persistent and hypoid peridium, paraphyses few and colorless, walls thick on the dorsal face and apex; *P. pavida* Buriticá & Hennen has paraphyses colorless, wall 1–3 µm thick at apex, urediniospores with few and short echinulae, and 4 germ pores.

This is the first record of a rust on the host *Croton salutaris* Casar., a native Brazilian plant.

The species is distributed in Brazil, and its life cycle is unknown.

Dichotomous key of the rust on *Croton* in the neotropics with anamorphs of the *Milesia* type (anamorphs associated with spermogonium are considered aeciospores)

1. Anamorph associated with spermogonium 2
1'. Anamorph not associated with spermogonium 4
    2. Aecia without paraphyses 3
    2'. Aecia with paraphyses ..... *Phakopsora crotonis*
        3. Aeciospores not with visible germ pores ..... *Milesia venezuelanae*
        3'. Aeciospores with visible germ pores ..... *Milesia valentula*
            4. Uredinia with few paraphyses 5
            4'. Uredinia with many paraphyses 6
                5. Urediniospores with many and short echinulae ..... *Phakopsora argentinensis*
                5'. Urediniospores with many and large echinulae ..... *Phakopsora mexicana*
                    6. Urediniospores with many and short echinulae, but associated with colorless paraphyses ..... *Phakopsora pavida*
                    6'. Urediniospores with few and large echinulae and associated with cinnamon-brown paraphyses ..... *Milesia crotonis-salutaris*

6. *Milesia rolliniae* Salazar & A.A. Carvalho *sp. nov.*
MycoBank: MB826696
Type: BRAZIL. RIO DE JANEIRO: Itatiaia, on *Rollinia dolabripetala* (Raddi) R.E Fr. (Annonaceae): entrada trilha Três Picos, 22º26.136'S, 44º36.547'W, 1,100 m altitude, 16.II.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 109-07* (Holotype RB480579!, Isotype MMUNM). Fig. 3a-b

Uredinia (*Milesia* type), subepidermal in origin, opening by a pore, peridia hyphoid evident at first; without paraphyses; urediniospores sessile.

Etymology: After *Rollinia*, the host genus.

Uredinia (*Milesia* type) on abaxial face of leaves, solitary or grouped, small, 100–165 µm in diameter, subepidermal in origin, opening by a pore, hymenia subepidermal and planar; peridia hyphoid evident at first; without paraphyses; urediniospores sessile, obovoid, ellipsoids, angular, 15–25 × 12–15 µm, echinulate walls arranged uniformly, 0.5–1 µm uniformly thick, pale yellow; germ pores not seen. **Additional specimens examined (Paratypes)**: BRAZIL. MINAS GERAIS: Bocaina de Minas, on *Rollinia dolabripetala* (Raddi) R.E Fr.: na trilha a Cachoeira do Alcantilado, 22º17.628'S, 44º33.513'W, 1,285 m altitude, 26.IV.2007, *M. Salazar Yepes, A.A. Carvalho Jr. & F. Santoro 342-07* (RB480609!). RIO DE JANEIRO: Itatiaia, trilhas Três Picos, 22º26.003'S, 44º36.408'W, 1,165 m altitude, 7.VIII.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 493-07* (RB480625!); ao redor do Hotel Donati, 22º26.491'S, 44º36.053'W, 1,010 m altitude, 22.II.2008, *M. Salazar Yepes & A.A. Carvalho Jr. 115-08* (RB480583!); na estrada ao Hotel Donati, 22º26.680'S, 44º36.550'W, 955 m altitude, 18.VI.2008, *M. Salazar Yepes & A.A. Carvalho Jr. 178-08* (RB480587!).

According to Cummins & Hiratsuka (2003), the genera of Pucciniales that parasitizes the Annonaceae family in the tropics are: *Batistopsora*, *Ceratocoma*, *Dasyspora*, *Hennenia*, *Phakopsora*, *Sphaerophragmium*, and *Sphenospora*. *Ceratocoma* and *Dasyspora* are microcyclic, as only teliospores are found in their life cycles. *Hennenia* has a demicyclic life cycle, with unknown uredinia, while the other genera are macrocyclic, with long life cycles with all of their stages known. The genera *Sphaerophragmium* and *Sphenospora* have uredinia with an *Uredostilbe* morphology, with peridium and without paraphyses, and are therefore different from *Milesia* and *Batistopsora*. The three most frequent anamorphic genera in the genus *Phakopsora* are *Malupa*, *Milesia*, and *Physopella* (Buriticá & Hennen 1994), to which Beenken (2014) added *Uredo*. Only two species of the genus *Phakopsora* have been reported on the plant genus *Annona*: *Phakopsora neocherimoliae* (Cummins) Buriticá & J.F. Hennen, (with an anamorph of the *Physopella* type) and *Phakopsora rolliniae* (W.T. Dale) Beenken (with an anamorph of the *Uredo* type), thus differing from the new anamorphic species.

The species *M. rolliniae* is the first record of a rust on the plant genus *Rollinia*, and the first species of the genus *Milesia* found on the Annonaceae family.

The species is distributed in Brazil, and its life cycle is unknown.

7. *Physopella citharexyli* Salazar & A.A. Carvalho *sp. nov.*
MycoBank: MB826698
Type: BRAZIL. RIO DE JANEIRO: Itatiaia, on *Citharexylum* sp. (Verbenaceae), ao redor do Abrigo 4 (Mata Atlântica), 22º27.108'S, 44º36.663'W, 815 m altitude, 6.VIII.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 476-07* (Holotype RB480624!, Isotype MMUNM). Fig. 3c-g

Uredinia (*Physopella* type), hymenia planar; paraphyses abundant, curved, surrounding the sorus and on the hymenia, thickened on the dorsal side; urediniospores 24–39 × 18–24 µm; walls thin, evenly echinulate, pale yellow to pale brown; germinative pores not seen.

Etymology: After *Citharexylum*, the host name.

Uredinia (*Physopella* type) on abaxial face of the leaves, solitary or grouped, small, 180–250 µm in diameter, subepidermal in origin, rupturing of the epidermis conspicuous, pulverulent, pale yellow; hymenia planar, cinnamon-brown; paraphyses abundant, curved, small, surrounding the sorus and on the hymenia, up to 30 µm in long, thickened on the dorsal side, up to 5 µm thick, initially colorless, later dark yellow; urediniospores obovoid, ellipsoid to oblong-ellipsoid, 24–39 × 18–24 µm; walls thin, 0.5–1 µm, of uniform thickness, evenly echinulate, pale yellow to pale brown; germinative pores not seen.

The new species *Physopella citharexyli* constitutes the first record of a rust on the genus *Citharexylum,* and the first species of the genus *Physopella* on the *Verbenaceae* family. Verbenaceae is host of rust fungi from the families Chaconiaceae (*Hemileia*) (Ritschel 2005), Pucciniaceae (*Aecidium* and *Puccinia*) (Sydow & Sydow 1904), and Uropyxidaceae (*Prospodium*) (Cummins 1940; Carvalho & Hennen 2010) - all without any relationship to the genus *Physopella*.

The species is distributed in Brazil, and its life cycle is unknown.

8. *Uredo abatiae* Salazar & A.A. Carvalho *sp. nov.* MycoBank: MB826699

Type: BRAZIL. MINAS GERAIS: Itamonte, on *Abatia americana* (Gardner) Eichler (Salicaceae), km 2 na estrada Garganta do Registro-Agulhas Negras, 22º22.279'S, 44º45.212'W, 1,835 m altitude, 25.IV.2007, *M. Salazar Yepes, A.A. Carvalho Jr. & F. Santoro 300-07* (Holotype RB480603!, Isotype MMUNM). Fig. 3h-k

Uredinia (*Uredo* type), paraphyses cylindrical, surrounding the sori and on the hymenia, up to 39 µm long, wall 1–1.5 mm thick; urediniospores 18–24 × 15–18 µm; wall with thin and uniformly arranged echinulae, 1 µm uniform thickness; germ pores not seen.

Etymology: After *Abatia*, the host genus.

Uredinia (*Uredo* type) on abaxial face of leaves, solitary or grouped, 120–250 µm in diameter, small, subepidermal in origin, conspicuously rupturing the epidermis, pulverulent, orange; paraphyses cylindrical, surrounding the sori and on the hymenia, 30–39 × 9–15 µm, wall 1–1.5 mm thick, colorless; urediniospores globose, obovoid or oblong-ellipsoid, 18–24 × 15–18 µm; wall with thin and uniformly arranged echinulae, 1 µm uniform thickness, pale yellow or colorless; germ pores not seen.

Additional specimens examined (Paratypes): BRAZIL. MINAS GERAIS: Itamonte, on *Abatia americana* (Gardner) Eichler, km 2 na estrada Garganta do Registro-Agulhas Negras, 22º22.279'S, 44º45.212'W, 1,835 m altitude, 13.VI.2007, *M. Salazar Yepes & A.A. Carvalho Jr 431-07* (RB480619!); km 3 da estrada Garganta do Registro-Agulhas Negras, 22º22.516'S, 44º45.078'W, 1,940 m altitude, 10.X.2007, *M. Salazar Yepes & A.A. Carvalho Jr. 624-07* (RB480638!); ao redor do Brejo

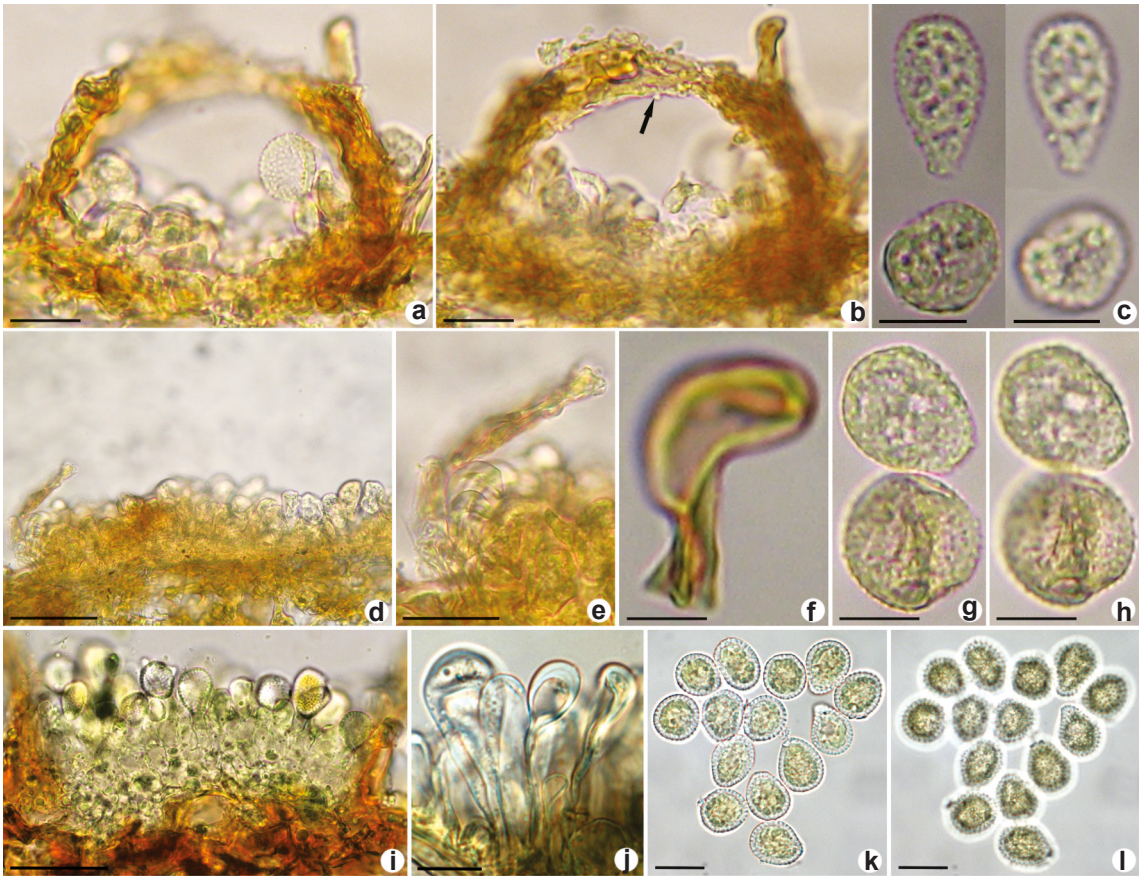

Figure 3 – a-b. *Milesia rolliniae* – a. two focal planes (surface and median) of the uredinios, subepidermal hymenium (arrow); b. urediniospores at median focus (left) and at surface focus (right). c-g. *Physopella citharexyli* – c. general view of uredinia; d-e. paraphyses – d. around the sori; e. paraphyses; f-g. urediniospores – f. median focus; g. surface focus. h-k. *Uredo abatiae* – h. general view of uredinia; i. paraphyses; j-k. urediniospores – j. median focus; k. surface focus. Bars: a,d,f-g,j-k = 20 µm; b,e,i = 10 µm; c,h = 50 µm.

da Lapa, 22º21.262'S, 44º44.081'W, 2,130 m altitude, 19.II.2008, *M. Salazar Yepes & A.A. Carvalho Jr. 04-08* (RB480575!); km 6 na estrada Garganta do Registro-Agulhas Negras, ao redor da casa de Pedra, 22º22.123'S, 44º44.705'W, 2,055 m altitude, 20.II.2008, *M. Salazar Yepes & A.A. Carvalho Jr. 75-08* (RB480645!).

This new species, *Uredo abatiae*, is the first record of a rust on the plant genus *Abatia*. In Brazil, Hennen *et al.* (2005) recorded five species of genus *Melampsora* on the family Salicaceae: *Melampsora epitea*, *M. larici-populina*, *M. medusae*, *M. occientalis*, and *M. populnea* are clearly different from the new species because all of them have capitate paraphyses up to 80 µm long, thick apical walls, and urediniospores with walls aculeate-verrucose and echinulate-verrucose.

The species is distributed in Brazil, and its life cycle is unknown.

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