



Taxonomic novelties in *Lepra* (Ascomycota, Pertusariaceae): a new species from China and four new combinations for isidiate species

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ABSTRACT: *Lepra picrolichenica* sp. nov., collected from Guangxi and Guangdong Provinces in China, is described and illustrated. The new species is distinguished by the cylindrical fragile isidia with pink or orange-red rounded apices and presence of picrolichenic acid. Four species of the lichen genus *Pertusaria* s.lat. are transferred to the genus *Lepra* Scop., and diagnostic characteristics of each species are briefly described. A key to all 14 isidiate species of *Lepra* lacking xanthonenes and occurring on bark is also provided.

KEY WORDS: *Lepra picrolichenica*, lichen-forming fungi, Ochrolechiaceae, *Pertusaria*, Pertusariales.

INTRODUCTION

The lichen genus *Lepra* was originally described by Scopoli in 1777 and was largely overlooked until its revival in 2016 following molecular phylogenetic studies to include species formerly placed in the *Pertusaria albescens* species group (Hafellner and Türk, 2016; Lendemer and Harris, 2017; Wei *et al.*, 2017).

The genus is generally characterized by sterile crustose thalli having isidia or soredia, however, when fertile with disciform apothecia, weakly amyloid to non-amyloid hymenial gel, strongly amyloid asci lacking distinct amyloid structures at their tips and ascus with one or two single-layered, thin-walled ascospores (Hafellner and Türk, 2016; Archer and Elix, 2018) and presence of depsone *viz.* picrolichenic acid and its homologues, depsidones such as fumarprotocetraric and norstictic acids, β -orcinol *m*-depsides such as thamnolic and hypothamnolic acids, β -orcinol *p*-depsides such as barbatic and squamatic acids, fatty acids and lichexanthone (Archer and Elix, 2018).

The members of this genus are primarily epiphytic, colonizing the bark of various tree species, however, some species also inhabit rocks and soil, and are distributed globally (Archer and Elix, 2018; Ren, 2019).

To date *ca.* 100 species of *Lepra* are reported from the world (Hyde *et al.*, 2024) of which 37 species were known from China (Ren, 2019). A decade back, the first author (QR) collected several specimens of *Lepra* from the subtropical evergreen broad-leaved forests of South China, which lack fruiting body, and have abundant isidia and contain picrolichenic acid. After comparisons with the known isidiate species of *Lepra* lacking xanthonenes and colonizing bark, these specimens belong to one undescribed species, which herewith is described here as new to science. Besides this, herewith we also make the necessary transfers for isidiate species of the group, and

proposed four new combinations *viz.* *Lepra hypoprotocetrarica* (A.W. Archer & Elix) Q. Ren, *Lepra hypostictica* (Jariangpr.) Q. Ren, *Lepra ramulifera* (H. Magn.) Q. Ren and *Lepra wauensis* (Elix & A.W. Archer) Q. Ren. A key to all 14 isidiate corticolous species of *Lepra* lacking xanthonenes is also provided.

MATERIALS AND METHODS

The specimens studied were collected from Guangxi and Guangdong Provinces in South China, and are deposited in the herbaria of HMAS-L (Lichen section of Chinese Academy of Sciences), KUN (Kunming Institute of Botany, Chinese Academy of Sciences), SDNU (Shandong Normal University), TAI (National Taiwan University) and W (Naturhistorisches Museum Wien).

Morphological characters of all specimens were studied using an Olympus SZX 16 stereozoom dissecting microscope and an Olympus BX61 compound microscope and photographed using an attached Olympus DP72 digital camera. Spot tests with K (10% aqueous solution of potassium hydroxide), C (saturated solution of calcium hypochlorite), Pd (solution of *p*-phenylenediamine in 95% ethyl alcohol) were performed on the cortex and medulla along with UV reactions. Lichen secondary metabolites were identified by using standardized thin-layer chromatography (TLC) with solvents A, B and C (Orange *et al.*, 2010).

TAXONOMIC TREATMENTS

New species

Lepra picrolichenica Q. Ren, *sp. nov.* 岭南白衣 Fig. 1

Diagnosis: The new species is similar to *Lepra hypostictica*, but differs in solid isidia and the absence of hypostictic and stictic acids.

Mycobank No.: MB 857384

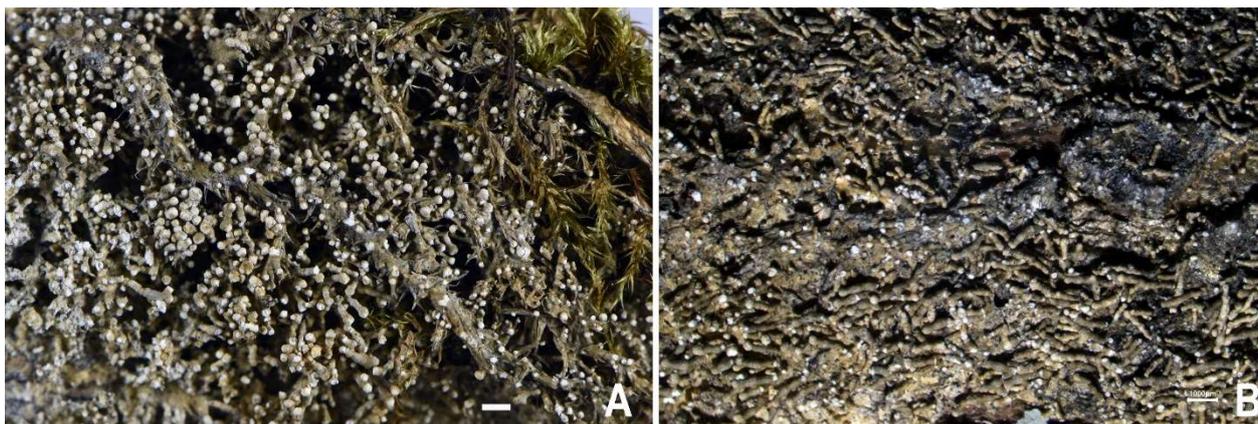


Fig. 1. *Lepra picrolichenica* Q. Ren thallus and habitat. A. Holotype, HMAS-L, Q. Ren 3585, B. paratype, SDNU, Q. Ren 3632. Scale bar = 1 mm.

Type: China, Guangxi Zhuang Autonomous Region: Nanning City, Daming Mountain (大明山), 1500 m elev., on bark and mosses growing on the bark, 21 May 2015, Q. Ren 3585 (holotype: HMAS-L, isotype: TAI).

Description: Thallus yellowish-gray to gray-green, continuous, thin, 0.1–0.3 mm thick, mostly shiny; cortex 50–70 μm thick, medulla 50–240 μm thick; soredia absent, isidia present, abundant, scattered to locally crowded, granular at first, cylindrical later, mostly simple, fragile, rarely with 2–3 branches, 0.1–0.3 mm diam., 0.5–1 mm tall, apices whitish, rarely yellowish-white, rounded; prothallus present, yellowish-white, shiny. Apothecia and pycnidia not seen.

Chemistry and spot tests: Cortex K–, C–, KC–, Pd–, UV–; medulla K–, C–, KC+ violet, Pd–. TLC: picrolichenic acid.

Etymology: The name of the new taxon refers to the presence of picrolichenic acid.

Distribution and habitat: This species is distributed between elevations of 1200–1600 m in China and is growing on broad-leaved tree, such as *Cinnamomum* sp., *Quercus* sp., and *Pentaphylax* sp., and also on the mosses growing on the bark in subtropical evergreen broad-leaved forests.

Additional specimens examined: China, Guangxi Zhuang Autonomous Region: Nanning City, Daming Mountain, 1400 m elev., on bark, 21 May 2015, Q. Ren 3541 (W); *ibid.*, on *Cinnamomum appelianum* Schewe, 21 May 2015, Q. Ren 3565 (SDNU); *ibid.*, 1200 m elev., on *Quercus* sp., 22 May 2015, Q. Ren 3632 (SDNU), 3633 (KUN). Guangdong Province: Shaoguan City, Nanling National Forest Park, 1600 m elev., on *Pentaphylax euryoides* Gardner & Champ., 16 May 2015, Q. Ren 3482 (HMAS-L), 3450 (SDNU).

Notes: *Lepra picrolichenica* is characterized by its fragile isidia being cylindrical, with whitish and rounded apices, and the presence of picrolichenic acid. *Lepra muricata* (J.C. David) A.W. Archer & Elix is also an isidiate species known from these areas, which is sterile and corticolous, however, it has thinner isidia (0.05–0.1 mm diam.), and contains stictic acid as a major compound with traces of constictic and cryptostictic acids (Archer, 1997; Ren, 2019).

Morphologically, this new species is similar to *Lepra hypostictica* (Jariangpr.) Q. Ren and *L. ramulifera* (H. Magn.) Q. Ren, however, *L. hypostictica* has hollow isidia and contains stictic acid as a major compound (Jariangprasert and Anusarnsunthorn, 2005, as *Pertusaria hypostictica*), while *L. ramulifera* has thinner isidia (0.05–0.15 mm diam.) and contains norstictic acid as a major compound (Elix *et al.*, 1997, as *Pertusaria ramulifera*).

Chemically, this new species is identical to *Lepra amara* (Ach.) Hafellner, but the latter one has white soredia and 1-spored ascus, and lacks isidia (Cannon *et al.* 2021).

New combinations

Lepra hypoprotocetrarica (A.W. Archer & Elix) Q. Ren, **comb. nov.**

Mycobank No.: MB 857388

Basionym: *Pertusaria hypoprotocetrarica* A.W. Archer & Elix, Mycotaxon 67: 161 (1998).

Diagnostic characters: Thallus pale fawn, upper surface smooth, shiny, isidiate, isidia 0.05–0.1 mm diam., 0.2–0.5 mm tall. Apothecia absent.

Chemistry: Cortex K–, C–, KC–, Pd–, UV–; medulla K–, C–, KC–, Pd–. TLC: hypoprotocetraric acid as a major compound (Archer and Elix, 1998, as *Pertusaria hypoprotocetrarica*).

World Distribution: Papua New Guinea (Archer and Elix, 1998).

Lepra hypostictica (Jariangpr.) Q. Ren, **comb. nov.**

Mycobank No.: MB 857387

Basionym: *Pertusaria hypostictica* Jariangpr., Mycotaxon 91: 283 (2005)

Diagnostic characters: Thallus olive green to green, upper surface smooth, glossy, isidiate, isidia hollow, 0.3 mm diam, 0.5–0.7 mm tall. Apothecia absent.

Chemistry: Cortex K+ yellow, C–, KC–, Pd–, UV–; medulla K+ yellow, C–, KC–, Pd+ orange. TLC: stictic acid as a major compound, alongwith hypostictic,



cryptostictic, peristictic and substictic acids as minor compounds (Jariangprasert and Anusarnsunthorn, 2005, as *Pertusaria hypostictica*).

World Distribution: Thailand (Jariangprasert and Anusarnsunthorn, 2005).

Lepra ramulifera (H. Magn.) Q. Ren, *comb. nov.*

Mycobank No.: MB 857389

Basionym: *Pertusaria ramulifera* H. Magn., in Magnusson & Zahlbruckner, Ark. Bot. 31A(no. 6): 56 (1944)

Diagnostic characters: Thallus pale to dark fawn, upper surface smooth, isidiate, isidia 0.05–0.15 mm diam., 0.4–0.8 mm tall. Apothecia absent.

Chemistry: Cortex K+ yellow then red, C–, KC–, Pd–, UV–; medulla K+ yellow then red, C–, KC–, Pd+ yellow. TLC: norstictic acid as a major compound (Elix *et al.*, 1997, as *Pertusaria ramulifera*).

World Distribution: Hawaii, India, Papua New Guinea (Elix *et al.*, 1997).

Lepra wauensis (Elix & A.W. Archer) Q. Ren, *comb. nov.*

Mycobank No.: MB 857390

Basionym: *Pertusaria wauensis* Elix & A.W. Archer, in Elix, Aptroot & Archer, Mycotaxon 64: 25 (1997)

Diagnostic characters: Thallus pale fawn, upper surface smooth and dull, isidiate, isidia simple, scattered, 0.1 mm diam., 0.3–0.6 mm tall. Apothecia absent.

Chemistry: Cortex K–, C–, KC–, Pd–, UV–; medulla K–, C–, KC–, Pd+ yellow. TLC: psoromic acid as a major compound (Elix *et al.*, 1997, as *Pertusaria wauensis*).

World Distribution: Malaysia, Norfolk Island, Papua New Guinea (Elix *et al.*, 1997).

Key to all corticolous isidiate species of *Lepra* lacking xanthones

1. Thallus with an uneven to verrucose-papillate surface; apothecia present in papillate warts; asci 1-spored; ascospores 160–280 x 50–80 µm *L. graeca* (Erichsen) Hafellner
1. Thallus with smooth surface; apothecia absent or rare, if present, asci 2-spored 2
2. Thallus pale pink to pale orange; isidia almost completely covering the thallus *L. roseola* (A.W. Archer & Elix) A.W. Archer & Elix
2. Thallus pale to dark fawn, grey, greenish, whitish, etc., but not pink to pale orange; isidia dense or scattered, but not completely covering the thallus 3
3. Occurring in cool-temperate to boreal-montane areas of the Northern Hemisphere; usually on siliceous rocks, and very rarely on bark and wood; apothecia rare; asci 2-spored; ascospores 80–140(–200) x 40–80 µm *L. corallina* (L.) Hafellner
3. Occurring mostly in the tropical to subtropical regions; always on bark; apothecia absent 4
4. Isidia larger, 0.3–0.4 mm diam., 1.0–3.0 mm tall *L. ramulifera* (H. Magn.) Q. Ren
4. Isidia smaller, usually less than 0.3 mm diam. and less than 1.0 mm tall 5
5. Isidia thinner, 0.03–0.05 mm diam.; thamnolic acid present *L. trichosa* (Elix & A.W. Archer) A.W. Archer & Elix
5. Isidia thicker, 0.05–0.3 mm diam.; thamnolic acid absent 6
6. Isidia hollow, 0.3 mm diam.; hypostictic and stictic acids present *L. hypostictica* (Jariangpr.) Q. Ren

6. Isidia solid, usually <0.3 mm diam.; hypostictic acid absent, stictic acid present or absent 7
7. Medulla KC+ violet, only picrolichenic acid present; isidia thicker, 0.1–0.3 mm diam. *L. picrolichenica* Q. Ren
7. Medulla KC– or KC+, but never KC+ violet, picrolichenic acid absent; isidia thinner, ≤0.1 mm diam. 8
8. Thallus K–, C–, KC–, Pd– 9
8. At least one spot test positive (K+, C+, KC+ or Pd+) 10
9. Barbatic acid as a major compound; isidia 0.1 mm diam., 0.2–0.3 mm tall; known from New Zealand, Eastern Australia and Tasmania *L. barbatica* (A.W. Archer & Elix) I. Schmidt, Hodgkinson & Lumbsch
9. Hypoprotocetraric acid as a major compound; isidia 0.05–0.1 mm diam., 0.2–0.5 mm tall; known from Papua New Guinea *L. hypoprotocetrarica* (A.W. Archer & Elix) Q. Ren
10. Thallus K– or K+ pale brown, protocetraric acid present as a major compound, with additional traces of conprotocetraric and ±viresnic acids *L. umbricola* (A.W. Archer & Elix) A.W. Archer & Elix
10. Thallus K+ yellow or red, protocetraric acid present or absent, conprotocetraric and viresnic acids absent 11
11. Protocetraric acid present as a major compound, with additional minors of norstictic and salazinic acids *L. wallamanensis* (A.W. Archer & Elix) A.W. Archer & Elix
11. Protocetraric, norstictic and salazinic acids absent 12
12. Stictic acid present as a major compound, with traces of constictic and cryptostictic acids, neotricone or psoromic acid absent *L. muricata* (J.C. David) A.W. Archer & Elix
12. Stictic, constictic and cryptostictic acids absent, neotricone or psoromic acid present 13
13. Neotricone present as a major compound; isidia 0.05–0.1 mm diam., 0.5–1.0 mm tall; known from Australia *L. neotriconica* (Elix & A.W. Archer) A.W. Archer & Elix
13. Psoromic acid present as a major compound; isidia 0.1 mm diam., 0.3–0.6 mm tall; known from Papua New Guinea *L. wauensis* (Elix & A.W. Archer) Q. Ren

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