



***Leucodermia guzmaniana* sp. nov. (Physciaceae, Lecanorales), a new species from Mexican cloud forest, and a key to *Leucodermia* in Mexico**

Guzmán-Guillermo J*¹, Díaz-Escandón D² and Medel-Ortiz R³

¹Facultad de Biología. Universidad Veracruzana, Veracruz, Mexico

²Herbario de la Universidad Del Valle CUVV, Valle del Cauca, Colombia

³Instituto de Investigaciones Forestales. Universidad Veracruzana, Veracruz, Mexico

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Abstract

Leucodermia guzmaniana Guzmán-Guillermo, Díaz-Escandón & Medel is described as a new species of lichen fungus, being characterized by terminal soredia and marginal white cilia covered with a red pigment that reacts K⁺ purple. The new species named after renowned Mexican Mycologist Dr. Gastón Guzmán. *Leucodermia guzmaniana* was collected in a cloud forest in Veracruz, Mexico.

Key words – Cloud forest – *Heterodermia* – new species

Introduction

Mexico has vast and unexplored lands, and there are still gaps in the information related to the diversity of various types of vegetation including neotropical ecosystems such as the cloud forest (CF) (Herrera-Campos et al. 2014). The cloud forest in Mexico is distributed mainly in central and southern regions of the country, and its fragmented distribution make it one of the most degraded ecosystem, with less than 50% its original coverage (González-Espinosa et al. 2012, CONABIO 2010). The cloud forest is recognized by its high biodiversity in all groups of plants, trees, shrubs, epiphytes, herbs and its high levels of endemism (Williams-Linera 2015).

Leucodermia Kalb is a very common genus in Mexican cloud forest. It was recently established as a separate genus from *Heterodermia* Trevis. (Mongkolsuk et al. 2015), based on its ribbon-like, usually ascending, dichotomously branched lobes forming a three-dimensional thallus, with a thick revolute margin, absence of a lower cortex, and presence of sporoblastidia in the ascospores. *Leucodermia* is widespread around the world, from the tropics to temperate zones, commonly found at mid elevations in humid and usually well-conserved areas (Lücking et al. 2008). In the past few years, some *Leucodermia* species have been described based on newly recognized structures within the genus, such as cilia covered with dust-like pigments that react with KOH test in *H. rubrotricha* (Weerakoon & Aptroot 2013) and phyllidia along the lobe margin in *L. borphyllidiata* (Mongkolsuk et al. 2015).

Currently, *Leucodermia* includes ten species listed in Mycobank and Index Fungorum. Nine of these have been recorded in Mexico and three species now classified within this genus have been described from this country (Kurokawa 1962). However, the total species richness in *Leucodermia*

is not known; recent molecular works shows that the diversity in this genus may have been underestimated, and species delimitation in *Heterodermia* s.l. is still not well understood (Díaz-Escandón & Lücking 2016). For instance, species like *L. leucomelos* likely represent a species complex.

Materials and Methods

The material was collected in cloud forest and secondary vegetation in Xalapa, Veracruz, Mexico. The description of the material is based on the characteristics considered by Mongkolsuk et al. (2015). Standard methods in lichenology were used according Brodo et al. (2001), including a K test for the cilia by cutting the cilia along the base and submerging them in a drop of K (KOH 10%) solution and placing them over a slide. To analyze the secondary metabolites in the thallus and cilia, a TLC was performed, using solvent C (toluene/acetic acid 170:30), and the spots were analyzed with the program WINTABOLITES (Mietzsch et al. 1994). The material were deposited in XAL and XALU herbaria.

Leucodermia guzmaniana Guzmán-Guillermo, Díaz-Escandón & Medel sp. nov. Figs 1–3

Mycobank number: MB831662

Etymology – Dedicated to the later Dr. Gastón Guzmán, an eminent mycologist of Mexico who dedicated his life to mycology including the study of lichens (Guzmán-Dávalos & Cifuentes 2018).

Typus – MEXICO, Veracruz, City of Xalapa, Ecological Park “El Haya”, May 10, 2015. J. Guzman-Guillermo, 71 (XAL-holotypus).

Additional specimens examined – MEXICO: Veracruz: municipality of Xalapa, city of Xalapa, Ecological Park “El Haya”. Mayo 10, 2015, J. Guzman-Guillermo, 92 (XALU); USBI Xalapa campus area, April 3, 2016, J. Guzman-Guillermo, 170,171, 172 (XAL); municipality of Coatepec, camino antiguo a Briones, January 8, 2017, J. Guzman-Guillermo, 501, 502, 503 (XAL).

Thallus foliose to sub-fruticose, loosely attached to ascendant, forming irregular, tangled mats, to 4-8 cm in diameter. Lobes 1-4 mm wide, ribbon-like, dichotomously branching, with flat to slightly circinate apices; lobes with long, simple, white to reddish, marginal cilia. Upper surface ivory to grayish green, epruinose, cortex 55-60 µm thick. Medulla white (see fig. C). Lower surface without cortex, slightly canaliculate, margins corticate, medulla compact to powdery and becoming sorediate, white throughout to light brownish. Soralia apical to subapical, soredia granulose, white to grey. Apothecia not seen. Pycnidia not seen. Photobiont a species of *Trebouxia* sp., forming clusters in the algal layer.

Chemistry – Cortex K+ yellow, C-, KC-, UV-; medulla K+ yellow turning orange to reddish, C-; cilia K+ violet (see Fig. B); containing atranorin (major) and salazinic acid, and a unidentified pinkish compound with RF 60 (cilia).

Habitat and distribution – Only known from few localities in Xalapa, Veracruz, Mexico. Mainly growing on tree trunks on cloud forest or secondary vegetation in parks, *Pinus* sp., *Liquidambar styraciflua*, *Quercus* sp., *Spathodea campanulata*, small shrubs such as *Gardenia* sp. and *Rhododendron* sp., and occasionally growing over mosses.

Discussion

Leucodermia guzmaniana is characterized by its red marginal cilia. It is most similar to *L. leucomelos* (L) Kalb, which has white to mostly black marginal cilia that lack any pigment. The new species differs from *L. leucomelos* by its white to reddish marginal cilia with a distinct K+ violet reaction, which is not caused by the decay of salacinic acid as it may happen in other *Heterodermia* s.l. species with reddish tips and sometimes pinkish cilia (Kurokawa 1962, Trass 2000, Moberg 2011). *Heterodermia rubrotricha* Weerakoon & Aptroot has the same K+ violet reaction in the marginal cilia but it can be separated from *L. guzmaniana* by the black cilia, apothecia and narrower lobes (Weerakoon & Aptroot 2013). Other similar species are *H. kurokawae* Trass and *L. appalachensis* (Kurok.) Kalb which has white cilia without pigment, but a

yellow pigment on the lower surface. Yet another species with elongated lobes and similar appearance is *H. arvidssonii* Moberg, but it has pinkish pigment on the underside and darkening marginal cilia (Moberg 2011). The new species may also be confused with *H. lineare* Moberg & T.H. Nash by its white marginal cilia, but *H. lineare* has a robust thallus and abundant apothecia (Table 1).

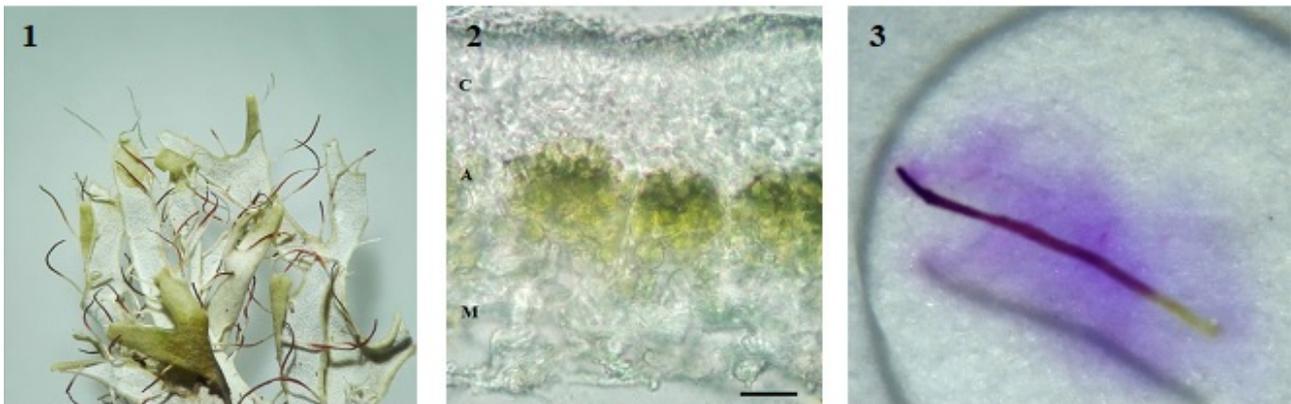


Fig. 1–3 – 1 *Leucodermia guzmaniana* Guzmán-Guillermo, Díaz-Escandón & Medel *typus*. 2 Transversal section of a lobe, C: cortex, A: algal layer, M: medulla. 3 Red cilia showing a distinct K+ violet reaction, in KOH 3%. Scale Bars = 20 µm.

Table 1 Species similar to *L. guzmaniana*.

Species	Cilia	K in cilia	Lower surface	R. S.
<i>H. arvidssonii</i>	White	Non-reactive	Pinkish	Soredia
<i>H. kurokawae</i>	White	Non-reactive	Yellowish patched	Apothecia
<i>L. appalachensis</i>	White	Non-reactive	Yellowish patched	Soredia
<i>H. linearis</i>	White	Non-reactive	White	Apothecia
<i>L. guzmaniana</i>	White	Purple	White	Soredia
<i>H. rubrotricha</i>	Black	Purple	White	Apothecia
<i>L. leucomelos</i>	Black	Non-reactive	White	Soredia (apothecia rare)

Notation: L.S: lower cortex, R.S: Reproduction structure. Moberg (2001), Weerakoon & Aptroot (2013), Trass (2000).

Key to known *Leucodermia* species in Mexico

This key contains all known species of *Leucodermia* in Mexico. It is based on observations and collections examined by us. The CNALH database and others works were examined of *Leucodermia* species in Mexico.

- 1a. Cilia white, covered with a K+ purple, red pigment*L. guzmaniana*
- 1b. Cilia white to black, without pigments2
- 2a. Lower surface with a yellowish, K- pigment (sometimes in patches)3
- 2b. Lower surface pure white or with red, K+ purple arachnoid patches4
- 3a. Pigment in patches on the lower surface, without apothecia*L. appalachensis* (Kurok.) Kalb
- 3b. Pigment all across the lower surface, sometimes with apothecia*L. lutescens* (Kurok.) Kalb
- 4a. Lower surface with violet to red, K+ purple arachnoid patches*L. vulgaris* s.l.
- 4b. Lower surface without pigmented patches, K-5
- 5a. Without soredia6

5b. Soredia present	7
6a. Medulla K-	<i>L. ciliatomarginata</i> (Linder) Kalb
6b. Medulla K+ yellow turning red, salazinic acid	<i>L. arsenei</i> (Kurok.) Kalb
7a. Tips strongly circinate, lobes thin, common in highlands	<i>L. circinalis</i> (Zahlbr.) Kalb
7b. Tips slightly revolute to flat	8
8a. Medulla K+ yellow turning red, salazinic acid	<i>L. leucomelos</i> (L.) Kalb
8b. Medulla K+ yellow, without salazinic acid	<i>L. boryi</i> (Fée) Kalb

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