



Lecanicillium sabanense sp. nov. (Cordycipitaceae) a new fungal entomopathogen of coccids

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Abstract

A new species of *Lecanicillium* was found associated with the soft scale insect *Pulvinaria caballeroramosae* (Coccidae), an important pest of *Ficus soatensis* (Moraceae) in Bogotá, Colombia. *Lecanicillium sabanense* sp. nov. differs from similar *Lecanicillium* spp. mainly in the size of the conidia, in the vertical arrangement of phialides on the host, and in the tomentose mycelium that sparsely covers the cuticle of the host. Phylogenetic analyses using *ITS*, *SSU*, *LSU*, *TEF*, *RPB1*, and *RPB2* also confirmed the distinctness of this new species. Fungal epizootics were found on female soft scale insects, which may have implications for biological control in the forestry program of the city. The ecology of the fungus as well as its potential use as a biological control agent are further discussed.

Key words: Ascomycota, *Cordyceps*, nomenclature, phylogeny, species description

Introduction

Lecanicillium W. Gams & Zare (Hypocreales, Ascomycota) is a genus that was segregated from the former *Verticillium* sect. *Prostrata* to place the insect pathogens with verticillate, aculeate phialides into a single group (Zare & Gams 2001). Nevertheless, *Lecanicillium* is still a paraphyletic and even polyphyletic genus within the Cordycipitaceae (Sung *et al.* 2007a); it also includes members that parasitize various arthropods, nematodes, and other fungi (Goettel *et al.* 2008; Zare & Gams 2008). *Lecanicillium lecanii* (Zimmerm) Zare & W. Gams is a well-known entomopathogenic fungus that is used in biological control of different pests (Goettel *et al.* 2008). It is tied to its teleomorph known as *Cordyceps confragosa* (Sung *et al.* 2007a). This species was broadly conceived by Gams (1971) and has been subdivided into several species comprised within the *L. lecanii* complex. Their phylogenetic relationship is still not clearly understood (Bischoff & White 2004; Goettel *et al.* 2008; Zare & Gams 2008). Nevertheless, new species have been recently proposed within this genus (Sukarno *et al.* 2009; Kaifuchi *et al.* 2013).

In 2011, the population of *Ficus soatensis* Dugand (Moraceae) was severely affected by the soft scale insect *Pulvinaria caballeroramosae* Tanaka & Kondo (Coccidae, Coccoidea, Hemiptera) in Bogotá, Colombia. *Ficus soatensis* is an ornamental tree, which is an essential constituent of the forestry program of Bogotá (Álvarez Lucero *et al.* 2008). This ornamental tree is ecologically important due to its strong relationship with wasps (Cardona *et al.* 2007). *Pulvinaria caballeroramosae* infestation causes twigs and branches to die, and in some cases the death of the whole tree (Tanaka & Kondo 2015). The morphological characteristics of these coccids as well as the environmental conditions of Bogotá have played a key role in the increased dissemination of the disease among the *F. soatensis* population (Gullan & Kosztarab 1997; Granara de Willink & Claps 2003; Kondo *et al.* 2013). Alternative methods to avoid the use of chemicals, which could be harmful to citizens, have become necessary to control this pest.

In this study, a new lecanicillium-like species was found parasitizing *P. caballeroramosae* collected from several *F. soatensis* trees in six different districts of Bogotá. We conducted multigene phylogenetic analyses using Maximum Likelihood and Bayesian inference, complemented with morphological studies, to determine the taxonomy of the lecanicillium-like isolates.