

First report of *Lecanodiaspis dendrobii* Douglas, 1892 (Hemiptera: Lecanodiaspididae) and the associated parasitoid *Cephaleta* sp. (Hymenoptera: Pteromalidae) in Brazil

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Abstract

Lecanodiaspis dendrobii Douglas, 1892 (Hemiptera: Coccoidea: Lecanodiaspididae) and the associated parasitoid *Cephaleta* sp. (Hymenoptera: Pteromalidae) are reported for the first time in Brazil. Specimens of this scale insect were collected on branches and stems of *Acacia mangium* Willd., *Leucaena leucocephala* (Lam.) de Wit (Fabaceae), *Morus nigra* L. (Moraceae), *Citrus reticulata* Blanco (Rutaceae), *Tectona grandis* L. f. (Verbenaceae), *Anacardium occidentale* (Anacardiaceae), *Annona squamosa* L. and *Xylopia aromatica* (Lam.) Mart. (Annonaceae), in three municipalities of the Roraima state. All plants here mentioned are recorded for the first time as a host for *L. dendrobii*. Morphological characters of *L. dendrobii* and symptoms presented by the host plants infested by this pest are included in this work.

Keywords: pest of quarantine importance, Fabaceae, Moraceae, Rutaceae, Verbenaceae.

Primeiro registro da cochonilha *Lecanodiaspis dendrobii* Douglas, 1892 (Hemiptera: Coccoidea: Lecanodiaspididae) e do parasitoide associado *Cephaleta* sp. (Hymenoptera: Pteromalidae) no Brasil

Resumo

Lecanodiaspis dendrobii Douglas, 1892 (Hemiptera: Coccoidea: Lecanodiaspididae) e o parasitoide associado *Cephaleta* sp. (Hymenoptera: Pteromalidae) são registrados pela primeira vez no Brasil. Exemplos dessa cochonilha foram coletados sobre ramos e fustes de *Acacia mangium* Willd., *Leucaena leucocephala* (Lam.) de Wit (Fabaceae), *Morus nigra* L. (Moraceae), *Citrus reticulata* Blanco (Rutaceae), *Tectona grandis* L.f. (Verbenaceae), *Anacardium occidentale* (Anacardiaceae), *Annona squamosa* L. e *Xylopia aromatica* (Lam.) Mart. (Annonaceae), em três municípios do Estado de Roraima. Todas as plantas aqui mencionadas são registradas pela primeira vez como hospedeiras de *L. dendrobii*. Caracteres morfológicos da cochonilha e sintomas das plantas hospedeiras infestadas por esta praga são incluídos neste trabalho.

Palavras-chave: praga de importância quarentenária, Fabaceae, Moraceae, Rutaceae, Verbenaceae.

1. Introduction

Lecanodiaspis dendrobii (Hemiptera: Coccoidea: Lecanodiaspididae) is a polyphagous scale insect that feeds on many plant species distributed in six botanic families: Euphorbiaceae, Fabaceae, Moraceae, Orchidaceae, Rutaceae and Verbenaceae (García et al., 2015).

Macroscopically the body of the adult female of *L. dendrobii* is purplish-brown, flattened, covered by a light brown test infused with secondary white wax;

test with longitudinal mediodorsal carina intersected by transverse raised lines. Male test similar in texture and appearance, more elongate. Microscopically *L. dendrobii* is characterized by having 3 to 5 cribriform plates on each side of body; anterior and posterior spiracular setae present; posterior spiracular furrows divided; antennae 7- to 9-segmented; legs rudimentary (Howell and Kosztarab, 1972; Miller et al., 2014).

Studies on the biology of this species have not been conducted yet and information about damages on their host plants are inexistent.

The lecanodiaspidid *L. dendrobii* was described by Douglas in 1892, collected on *Dendrobium calceolaria* (Orchidaceae) in Demerara, Republic of Guyana (Douglas, 1892). Later it was recorded in several places in Central and South America: Argentina (Buenos Aires, Cordoba, Corrientes, San Juan and Tucuman), Colombia, Guatemala, Honduras, Uruguay and Venezuela. Recently, it was also recorded in northern Mexico (Nearctic Region) (García et al., 2015). As a consequence of their presence in Mexico, this pest was already included on the list of pests of quarantine importance to the U.S. (Miller et al., 2014).

The state of Roraima is bordered by two countries where *L. dendrobii* has been reported, Republic of Guyana and Venezuela, thus their occurrence has been expected in Brazil.

The present paper aims to report *L. dendrobii* for the first time in Brazil, as well as its parasitoid, morphological characters of this scale insect, symptoms presented by the host plants infested by this pest and suggestions for its management are given.

2. Material and Methods

Samples suspected to contain specimens of *Lecanodiaspis dendrobii* were initially collected in Roraima State, Brazil, by the first author (A.L.M.J), on branches and stems of several host plants in the municipalities: Boa Vista, in a reforestation area on young and mature plants of *Acacia mangium* Willd. (Fabaceae) and on a young plant of *Xylopia aromatica* (Lam.) Mart. (Annonaceae), (N 03°08'04.2", W 60°49'45.8"), in December 2009; in young plants of *Leucaena leucocephala* (Lam.) de Wit (Fabaceae), (N 02°57'41.2", W 60°42'53.0"), in January 2010; on one mature plant of *Morus nigra* L. (Moraceae), (N 02°45'27.5", W 60°43'48.4"), in February 2010; and Cantá, on mature plants of *Citrus reticulata* Blanco (Rutaceae), (N 02°18'57.3", W 60°35'15.8"), in March 2010. Posteriorly, the fourth author (E.G.F.M) collected samples on mature plants of *Tectona grandis* Lf (Verbenaceae) in the municipality of Alto Alegre, (N 02°44'24.1", W 61°17'39.7"), in June 2011, on mature plants of *Anacardium occidentale* L. (Anacardiaceae) in the municipality of Cantá, (N 02°43'24.4", W 60°40'37.5"), in March 2012, and on plants of *Annona squamosa* L. (Annonaceae), also in Cantá (N 2°43'53.3", W 60°38'14.9"), in May 2014.

Part of the samples of the scale insect were stored in vials filled with 75% ethanol and the other part were placed in glass tubes, closed with cotton until the emergency of the parasitoids, and posteriorly stored in 100% ethanol. The scale insects and the hymenopterous parasitoid were identified respectively by the authors (A.L.B.G.P. and V.A.C.).

The lecanodiaspidids were mounted on microscopic slides following the methodology described by Gullan (1984) and identified according to morphological characteristics

of the adult female as described by Howell and Kosztarab (1972) and Miller et al. (2014). The hymenopterous parasitoids were double-mounted on points and identified using Bouček and Heydon (1997) at the genus level and pertinent literature for species. The specimens of coccoids were deposited at the Universidade Federal de São Carlos, São Carlos, São Paulo, Brazil and the hymenopterous parasitoids at the "Coleção de Insetos Entomófagos Oscar Monte", Instituto Biológico, Campinas, São Paulo, Brazil.

3. Results

All samples of lecanodiaspidids collected on *A. mangium*, *L. leucocephala*, *M. nigra* and *X. aromatica*, in Boa Vista; on *A. occidentale*, *C. reticulata* and *A. squamosa*, in Cantá; and *T. grandis*, in Alto Alegre; were identified as *Lecanodiaspis dendrobii* Douglas, 1892 (Hemiptera: Lecanodiaspididae) (Figure 1); and all these plants are recorded for the first time as host plants for *L. dendrobii*.

Based on material collected in Roraima, adult females (Figure 2) measure about 2.0-4.5 mm long and 1.5-3.5 mm wide. Eggs (Figure 3), and all instars of females and males (Figure 4) were found.

Mature plants when infested by *L. dendrobii* showed drying of apical branches (Figure 5), but when infestation occurred in young plants, injuries caused the death of the host (Figure 6). The honeydew excreted on the leaves, by this insect, favored the development of sooty mold (Figure 7), compromising plant photosynthesis and causing premature leaf drop.

The parasitoid associated with *L. dendrobii* was identified as *Cephaleta* sp. (Hymenoptera: Pteromalidae) (Figure 8) and it emerged from specimens collected on *M. nigra* in the municipality of Boa Vista.

4. Discussion

Lecanodiaspis dendrobii is the second species of the genus recorded in Brazil, previously only *Lecanodiaspis rugosa* Hempel, 1900 was known. The genus includes 54 species distributed in all zoogeographic regions except Antarctica, most restricted to Afrotropical and Australasian regions. For South America only seven of these species are known (García et al., 2015).

According Miller et al. (2014), *L. dendrobii* and *Lecanodiaspis prosopidis* (Maskell, 1895), distributed between South Mexico and North USA, may be synonyms. *Lecanodiaspis dendrobii* differs by having 2 long setae anterior of vulva (absent in *L. prosopidis*) (Howell and Kosztarab, 1972; Miller et al., 2014). In this case, due to great microscopic similarity between the two species, additional morphological and molecular studies may help to confirm this supposition.

Six years after the record of *L. dendrobii* in Brazil, in Boa Vista, it was found in rural areas of the two neighboring municipalities, Cantá and Alto Alegre (Figure 1), and on new host plants, showing a good adaptation of the species in the region.



Figure 1. Map of the State of Roraima indicating the points in each municipality* and host plants where *Lecanodiaspis dendrobii* Douglas, 1892 was collected. *¹Boa Vista, *Acacia mangium* and *Xylopia aromatica*; ²Boa Vista, *Leucaena leucocephala*; ³Boa Vista, *Morus nigra*; ⁴Cantá, *Citrus reticulata*; ⁵Cantá, *Anacardium occidentale* and *Annona squamosa*; ⁶Alto Alegre, *Tectona grandis*.

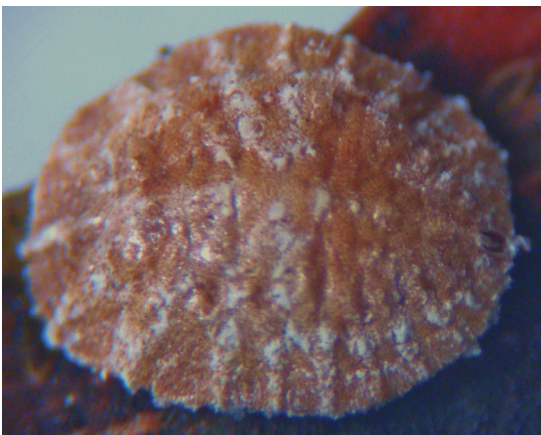


Figure 2. Adult female of *L. dendrobii*. Photo: Marsaro Júnior, A.L.

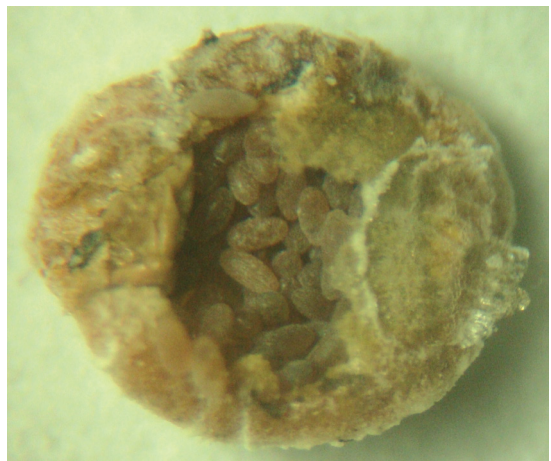


Figure 3. Eggs of *L. dendrobii*. Photo: Marsaro Júnior, A.L.



Figure 4. Colony of *L. dendrobii* in stem of *X. aromatica*. Photo: Marsaro Júnior, A.L.



Figure 5. Drying of apical branches of *M. nigra* due to infestation of *L. dendrobii*. Photo: Marsaro Júnior, A.L.

At short distances, immature stages of these insects are easily transported by wind, water or animals, whereas the dispersion over long distances is done mainly through transport by the host plants. For monitoring of the distribution of *L. dendrobii* in Roraima and other states, visual inspection would be the best method and, the main measure to reduce the spread of this insect is to avert that plants or part of plants infested by lecanodiaspidids can be transported to places free of this insect.



Figure 6. Death of young plant of *L. leucophela* due to infestation of *L. dendrobii*. Photo: Marsaro Júnior, A.L.

Although damage caused by *L. dendrobii* on their host plants has not been mentioned, Trelles (1938) reported that this pest was very abundant throughout Argentina, both in wild as cultivated plants, including *Citrus* spp. More recently, Granara de Willink and Claps (2003) made an inventory of scale insects associated to ornamental plants in Tucuman, Argentina, and they mentioned that *L. dendrobii* was not abundant on ornamental plants.

In Brazil, significant damage was recorded mainly on *A. mangium*, *M. nigra* and *L. leucocephala*. The injuries presented by these plants as partial or total plant dry is similar with those observed for some species of Diaspididae, differing from damage mentioned by Howell and Kosztarab (1972) to some members of Lecanodiaspididae that typically cause a depression in the host plant's tissues and often distortion of the shoots.

The natural enemies of *L. dendrobii* known until now are the gregarious endoparasitoids *Anisophleps alternata* Fidalgo, 1981 and *Metaphycus terani* Fidalgo, 1981



Figure 7. Sooty mold in leaf of *M. nigra* due to the honeydew excreted by *L. dendrobii*. Photo: Marsaro Júnior, A.L.



Figure 8. Adult female of *Cephaleta* sp., hymenopteran parasitoid associated with *L. dendrobii*. Photo: Costa, V.A.

(Hymenoptera: Encyrtidae), which have been observed on citrus in Tucuman, Argentina (Fidalgo, 1981). Blanchard (1938) also recorded the occurrence of a *Signiphora* species (Hymenoptera: Signiphoridae). *Marietta caridei* Brèthes, 1918 (Hymenoptera: Aphelinidae) has also been associated to *L. dendrobii* (De Santis, 1967), but, according to Hayat (1986), *Marietta* species are secondary parasitoids of Coccoidea. *M. caridei*, besides Argentina (Massini and Brèthes, 1918), also occurs in Brazil (Hayat, 1986) and Cuba (Hernandez and Ceballos, 1991 apud Noyes, 2014).

In Roraima state only the parasitoid *Cephaleta* sp. (Hymenoptera: Pteromalidae) was found in association with

L. dendrobii. Interactions between species of *Cephaleta*, *Cephaleta australiensis* (Howard, 1896), *Cephaleta brasiliensis* (De Santis, 1963) and *Cephaleta brunniventris* Motschulsky, 1859, with species of Asterolecaniidae, Cerococcidae, Coccidae, Eriococcidae and Pseudococcidae have been reported (Noyes, 2014), but with species of lecanodiaspidid is new.

This *Cephaleta* species is thought to be new because it differs from *C. brasiliensis*, the only specie of the genus known to occur in Brazil (De Santis, 1963), by the proportions of veins and absence of infumated area in the fore wings. Also, it differs from *C. brunniventris* and *C. australiensis*, which are the more widespread species of the genus, by the proportions of funicle segments and color of the gaster, in the case of *C. brunniventris*.

The potential of *Cephaleta* sp. in the biological control of *L. dendrobii* needs to be studied as well as the inventory of other potential predators and parasitoids.

Following the norms for the notification of the occurrence of exotic pest in the country, immediately after the confirmation of *L. dendrobii* in Boa Vista, Roraima, the Ministério da Agricultura, Pecuária e Abastecimento (MAPA) was communicated, according to IN 52 of the MAPA (Brasil, 2007), in order that preventive measures be taken to avert the spread of this pest for other Brazilian states.

Based on the observed damage in plants infested by *L. dendrobii* in the state of Roraima, this scale insect could become an important fruticulture and silviculture pest in Brazil, if biological control agents are not effective in controlling this exotic species.

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