

Mulberry (*Morus nigra* L., Moraceae) Hosting Scale Insects *Crypticerya brasiliensis* (Hempel, 1900) (Hemiptera: Monophlebidae) and *Pseudaulacaspis pentagona* (Targioni-Tozzetti, 1886) (Hemiptera: Diaspididae) in the Federal District, Brazil

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Abstract

The black mulberry tree (*Morus nigra* L. Moraceae), a perennial shrub, is one of the most abundant species in the urban afforestation of Brasília, Federal District, Brazil. This work records the first occurrence of *Crypticerya brasiliensis* (Hempel, 1900) (Hemiptera: Monophlebidae) and *Pseudaulacaspis pentagona* (Targioni-Tozzetti, 1886) (Hemiptera: Diaspididae) infesting *M. nigra* in the Federal District, Brazil. For this study, 20 specimens of *M. nigra* trees were inspected during September to October 2019, in two locations of the Federal District, Brazil, and the presence of scale insects were found on the trunks, stems, and leaves. The main damage caused by *C. brasiliensis* in the sampled trees were dry stems and branches along with yellow leaves, by the insects feeding mainly on the leaf veins. *Pseudaulacaspis pentagona* was observed on the branches and stems of the plant isolated from the second sampling point. Infested branches were dry and leafless, with many scale insects, and some branches displayed small cracks. This is the first time *M. nigra* has been registered as a host plant of *C. brasiliensis*, as well as first occurrence of *P. pentagona* infesting *M. nigra* in the Federal District, Brazil.

Keywords: phytophagous insect, agricultural entomology, damage in trees, scale insects

1. Introduction

The urban afforestation of Brasília, Federal District, Brazil, includes hundreds of trees that range from exotic to native species. Among these species, the black mulberry tree (*Morus nigra* L., Moraceae) is one of the most abundant and can be found in various parts of the city (Silva Júnior & Lima, 2010). Mulberry plants are grown on virtually every single continent and are highly adapted to various environmental and soil conditions (Ercisli & Orhan, 2007).

Its sweet fruit, and ornamental beauty, and abundant shade make *M. nigra* an appreciated perennial shrub (Silva Júnior & Lima, 2010; Okamoto et al., 2013). Its cultivation had begun in several Asian countries as its leaves can be used as food for rearing silkworms (Weiguo et al., 2005). In addition, studies indicate that its fruits and leaves have medicinal properties (Padilha et al., 2010; Oliveira et al., 2018).

From the insects associated to mulberry, several scale insects have been described, including representatives of the families Coccidae (7), Diaspididae (5), Pseudococcidae (5), and Lecanodiaspididae (1) (Garcia Morales et al.,

2016). Gallo et al. (2002) mention that the main mulberry pests are the scale insect *Pseudaulacaspis pentagona* (Targioni-Tozzetti, 1886) (Hemiptera: Diaspididae), caterpillars of *Automeris memusae* (Walker, 1855) (Lepidoptera: Saturniidae), and the beetles *Arniticus* sp. (Coleoptera: Curculionidae) and *Bolax flavolineatus* (Mannerheim, 1829) (Coleoptera: Scarabaeidae).

This work records the first occurrence of *Crypticerya brasiliensis* (Hempel, 1900) (Hemiptera: Monophlebidae) infesting *M. nigra* trees, as well as the first occurrence of *P. pentagona* in mulberry in the Federal District, Brazil.

2. Method

2.1 Presence of Scale Insects on Mulberry

Twenty *M. nigra* trees were inspected during September and October 2019, at two locations in the Federal District, Brazil, to observe the presence of scale insects on the trunks, stems, and leaves of the trees. This first sampling site was a small forest (15°45'12.4"S; 47°53'36.6"W) containing 19 mulberry trees. The second site (15°56'55.2"S; 48°10'00.8"W) was an isolated tree.

2.2 Slide-Mounted Procedures for the Scale Insects

The collected specimens were stored in plastic "ependorf type" tubes in 70% ethanol. Later, the specimens were mounted on slides following the method of Gullan (1984) and were identified with a compound light microscope. *Crypticerya brasiliensis* was identified using the key from Kondo et al. (2016a), and *P. pentagona* using Ferris (1937), and Claps and Wolff (2003), both based on adult female morphology.

2.3 Storage of Voucher Species

Voucher specimens were deposited in the following institutions: specimens of *C. brasiliensis* in the Reference Collection of Insects and Mites (CRIA) at the Universidade Estadual Paulista, Jaboticabal, São Paulo, Brazil; and *P. pentagona* in the Collection of "Ramiro Gomes Costa Museum of Entomology (MRGC), State Secretariat for Agriculture, Livestock, and Rural Development, Rio Grande do Sul (DDPA, SEAPDR, RS)".

3. Results and Discussion

3.1 Identification

Two species of scale insects were found in the evaluated plants, *C. brasiliensis* and *P. pentagona*.

3.2 *Crypticerya brasiliensis*

The most abundant species was *C. brasiliensis* (Figure 1), with nymphs and adult females observed on the leaves, stems, and trunks of 19 plants evaluated in the first location. Due to the large amount of honeydew eliminated by this monophlebidae, the tree structures infested by these insects had a large amount of sooty mold. The main damage caused by *C. brasiliensis* in the sampled trees were dry stem and branch and yellow leaves, with individuals feeding mainly on leaf veins. One of them was completely weakened by the attack of this scale insect and was less developed than others.

The Neotropical species, *C. brasiliensis*, was described from specimens collected in São Paulo, SP, and has been recorded in Panama, Colombia, Guyana, Peru, and Argentina. Although it is a polyphagous species, it has few known host plants, in which most of them are shrubs and ornamental trees, such as: fishtail palm (*Caryota* sp., Arecaceae); camphor tree (*Cinnamomum camphora* Nees & Eberm, Lauraceae); croton (*Codiaeum* sp., Euphorbiaceae); fig trees (*Ficus* sp., Moraceae), tulip tree (*Liriodendron tulipifera* L., Magnoliaceae); rose bush (*Rosa* sp., Rosaceae) (Hempel, 1912; Lizer y Trelles, 1938); and red bottlebrush flower (*Callistemon viminalis* (Sol. ex Gaertn.) G. Don, Myrtaceae) (García Morales et al., 2016).

This monophlebid was observed by Hempel (1900) often infesting stem and trunk of its hosts, and it has been reported to cause the dieback of numerous shade trees in São Paulo, Brazil. More recently, *C. brasiliensis* was recorded as causing significant damage to many types of shrubs and guava trees in the Department of Boyacá, Colombia, and in the state of São Paulo, Brazil; and on red bottlebrush flower in Goiânia, Goiás, Brazil (Kondo et al., 2016b).

3.3 *Pseudaulacaspis pentagona*

Pseudaulacaspis pentagona was observed on the branches and stems of the plant isolated from the second sampling site (Figure 2). The infested branches were dry and leafless, and some had small cracks.

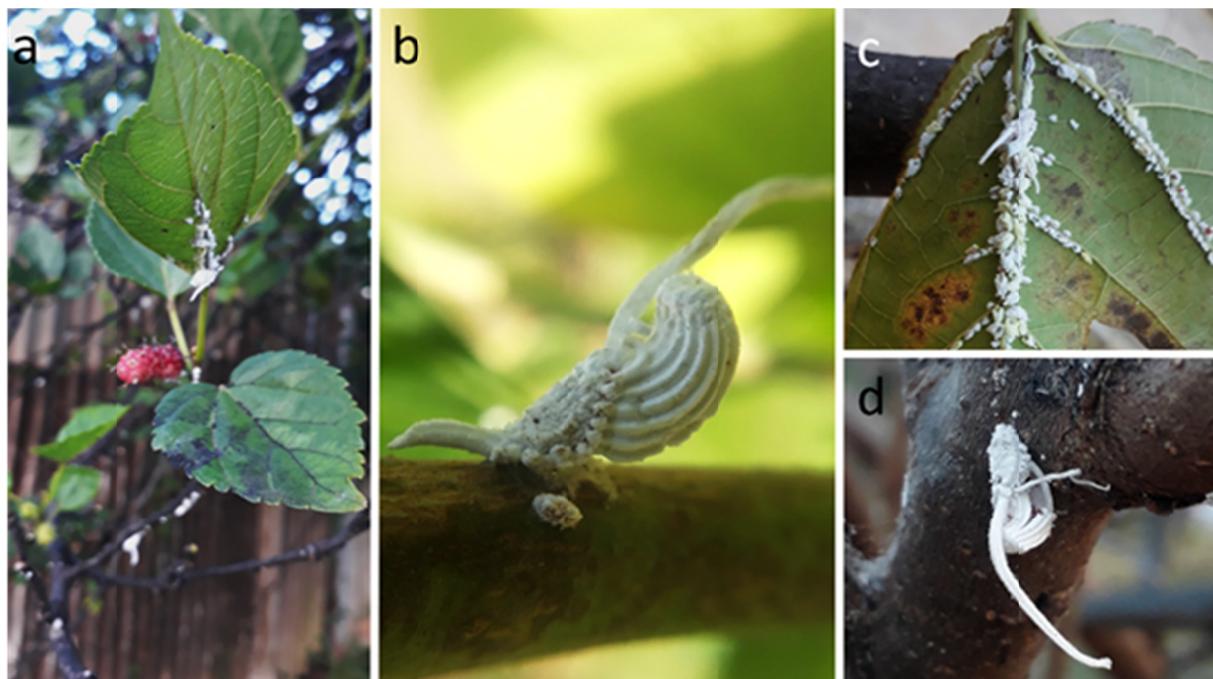


Figure 1. *Crypticerya brasiliensis* on *M. nigra*, Federal District, Brazil: (a) Infestation on the top leaf and sooty mold on inferior leaf, (b) Adult female and nymph on stem, (c) Detail of the monoflebitids arranged on the veins of abaxial leaf surface, (d) Dorsal view of adult female on trunk

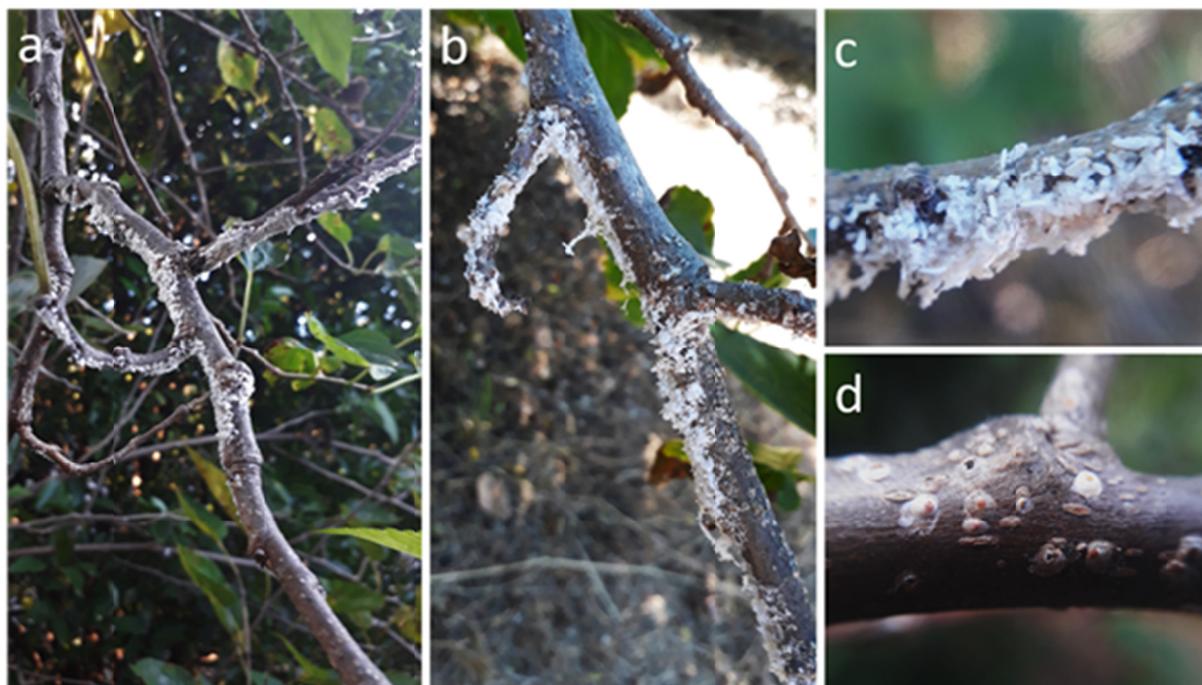


Figure 2. *Pseudaulacaspis pentagona* on *M. nigra*, Federal District, Brazil: (a), (b), (c) Armored scale insects - infested branches, (d) Detail of armored scale insects on the branch

Pseudaulacaspis pentagona of Palearctic origin, is a cosmopolitan and polyphagous species, and has been registered in 110 countries on host plants of 221 genera in 85 families (Garcia Morales et al., 2016). Exotic in South America, this diaspidid was first recorded on this continent in 1902 and is now widespread (Wyckhuys et

al., 2013). This diaspidid can be a major pest in many crops, including fruit and ornamental plants (Watson, 2002), and is listed by Miller and Davidson (1990) as a serious and widespread pest around the world.

This diaspidid is widely distributed in Brazil, in 10 states from North to the South region of the country, totaling a list of 30 host plants for these states. However, *P. pentagona* had not been recorded in the Federal District or in the state of Goiás (Silva et al., 1968; Claps et al., 2001). The most recent records of host plants includes passion fruit (*Passiflora edulis* Sims, Passifloraceae) in the state of Espírito Santo (Culik et al., 2008), olive tree (*Olea europaea* L., Oleaceae) in Minas Gerais (Prado & Silva, 2006) and in Rio Grande do Sul (Wolff et al., 2018). Although observed in only one *M. nigra* plant, at only one of the sampling sites evaluated in the municipality of Brasília, monitoring of this species is important due to its history and potential as a pest

4. Conclusion

Morus nigra is recorded for the first time as a host plant of *C. brasiliensis*, and *P. pentagona* is recorded for the first time in the Federal District, Brazil. More studies for a period of 12 months can be done and reveal aspects related to the population increase or reduction of these scale insects according to rainy and dry periods.

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