



Scientific Note

Occurrence of *Aetalion reticulatum* (Linnaeus) (Hemiptera: Aethalionidae) on *Dipteryx alata* Vogel (Fabaceae) in Minas Gerais, Brazil

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EntomoBrasilis 13: e930 (2020)

Edited by:

William Costa Rodrigues

Article History:

Received: 02.ix.2020

Accepted: 14.xi.2020

Published: 14.xii.2020

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Funding agencies:

↪ Without funding declared

Abstract. The *baruzeiro* or *baru* (*Dipteryx alata* Vogel) is a tree species native to Brazil that is known for its production of edible nuts with high nutritional value. However, little is known about the insects associated with this forest species. Therefore, this study aims to document the occurrence of leafhoppers on *baruzeiro* trees in the state of Minas Gerais, southeastern Brazil. We therefore examined *baruzeiro* plants in an afforestation plot at the Universidade Federal de Uberlândia (18°43'33"S; 47°31'31"W) in August 2020, located in the municipality of Monte Carmelo, Minas Gerais. The leafhopper species was identified as *Aetalion reticulatum* (Linnaeus) (Hemiptera: Aethalionidae). The ant species *Camponotus crassus* Mayr (Hymenoptera: Formicidae) was found to feed on the honeydew released by leafhoppers, demonstrating facultative mutualism between the species. This is the first report of *A. reticulatum* on *D. alata* in Minas Gerais.

Keywords: Cerrado of Minas Gerais; Fabaceae; facultative mutualism; honeydew-producing leafhopper; sucking insect.

The *baruzeiro* or *baru* (*Dipteryx alata* Vogel; Fabaceae) is a species native to Brazil widely distributed in the Cerrado biome. The tree has an average height of 15 meters, though it can reach 25 meters and is found mainly in regions with medium-fertility soils (SANO *et al.* 2006). In Brazil, *D. alata* occurs naturally between latitudes 5° 30' S in the state of Maranhão and 22° S in the state of São Paulo, at altitudes ranging from 110 m in Mato Grosso to 1,200 m in the Distrito Federal (CARVALHO 2003).

The *baruzeiro* can be used for several purposes such as providing shade, forage, wood, nutrient cycling, plant litter decomposition, human food, and is a potential candidate for commercial cultivation (SANO *et al.* 2006). According to FERNANDES *et al.* (2010), the toasted *baru* nut has been used in human diets due to its high protein value and pleasant taste. In addition, oil can be extracted from lipid-rich nuts (FERNANDES *et al.* 2010).

The *baru* and its products are harvested via extractive activities in its natural habitat. However, the dearth of information about its biology and management makes it difficult to carry out these activities in a sustainable manner (SOUSA *et al.* 2011). Likewise, little is known about the insect fauna associated with *D. alata*, especially with respect to potential pests that may compromise its development and propagation.

There have been reports of fruit pulp damage by insect species, mainly belonging to the orders Coleoptera and Lepidoptera (CARVALHO 2003; SANO *et al.* 2006). In 2017, CASTRO *et al.* (2019) observed the occurrence of the honeydew-producing leafhopper *Aetalion reticulatum* (Linnaeus) (Hemiptera: Aethalionidae) in *baruzeiros* in Brasília, Distrito

Federal.

This study aims to document the occurrence of leafhoppers in *baruzeiros* in the state of Minas Gerais, Brazil. To this end, in August 2020, three-year-old plants of *D. alata* about 2.5 meters in height were examined using a ladder. The trees are part of an afforestation plot at the Universidade Federal de Uberlândia, Monte Carmelo Campus (18°43'33"S; 47°31'31"W), in the municipality of Monte Carmelo.

The *baruzeiro* plants on the afforestation plot have vegetation nearby. To the west, the vegetation is composed of an orchard of herbaceous plants, located about 15 meters away. To the east, the *baruzeiros* are bordered by an asphalt road about five meters away. To the north and south, the vegetation consists of creeping plants with a predominance of Poaceae species that receive regular mechanical cutting.

The municipality of Monte Carmelo is located in the mesoregion of Alto Paranaíba and is situated at an altitude of about 890 m, with vegetation typical of the Cerrado biome. The mesoregion is located in the basin of the Paranaíba River, and the soils are predominantly red latosols. The region is characterized by a seasonal climate of the type Aw according to the Köppen climate classification with two well-defined seasons: hot and rainy summer and cold and dry winter. The average temperature is 20.7 °C, and the average annual rainfall is 1,569.1 mm (PRADO JÚNIOR *et al.* 2012).

In August 2020, from 1 pm to 4 pm, each plant was observed in 15 min intervals for a total sampling effort of 90 min per plant. Two *baruzeiro* plants, about eight meters away from each other, were examined. In one of them, oviposition, nymphs, and adult leafhoppers were observed on all

branches in varied numbers (Figure 1A). Ants feeding on honeydew released in the feces of the leafhoppers were also observed (Figure 1A). The presence of the leafhopper species in the nearby vegetation was not verified.

The specimens were photographed *in situ* with an Olympus SP-620UZ 16MP camera. Adult specimens and nymphs of leafhoppers and ants were collected with tweezers, packed in labeled flasks containing 70% alcohol, and then taken to the Laboratório de Entomologia Florestal (LAENF) of the Monte Carmelo Campus.

The specimens were mounted with entomological pins in the laboratory, and identification was carried out to the lowest possible taxonomic level using an SZ40 Marca-Physis stereoscope microscope. The taxonomist Dr. Wilson Sampaio de Azevedo Filho (Universidade de Caxias do Sul) confirmed the identification of the leafhopper species using morphological comparisons and appropriate literature (SANTOS *et al.* 2015; ZANUNCIO *et al.* 2015; CASTRO *et al.* 2019). The identification of the ant species was carried out with the help of the taxonomist Dr. Jacques Hubert Charles Delabie (Centro de Pesquisas do Cacau – CEPEC/CEPLAC) and confirmed using the study of ANTONIO *et al.* (2014) and the AntWeb electronic catalog (NOBILE 2015).

The leafhopper species was identified as *A. reticulatum* (Figures 1A and 1B), and the ant species was identified as *Camponotus crassus* Mayr (Hymenoptera: Formicidae) (Figure 1A) on one of the two *baruzeiro* plants analyzed (Figure 1C).

Aetalion reticulatum is widely known as honeydew-producing leafhopper since it is of economic importance for a diversity of fruit species. Adults measure about 10 mm in length, have a rust-brown coloration, and the ribs of the wings are protruding and greenish. Females oviposit masses of up to 100 eggs enveloped in a brown-gray choleric substance on plant branches and/or fruit peduncles. The incubation period of the eggs is about 30 days, during which the female protects the spawning eggs with her body (Figure 1B). The nymphs have a grey coloration with red striations, and this

stage lasts approximately 45 days. Both nymphs and adults suck the sap from the plants, damaging the development of fruits and sprouts; heavy infestations can cause the death of the plant (GALLO *et al.* 2002).

The honeydew-producing leafhopper is polyphagous and has been found in a variety of plants. In Brazil, these include a number of economically important native forest species, such as *D. alata* in Brasília (CASTRO *et al.* 2019), the “sombreiro” *Clitoria fairchildiana* Howard (Papilionoideae) in the state of São Paulo (ODA *et al.* 2009), the açai palm *Euterpe oleracea* Martius (Arecaceae) in the state of Acre (SANTOS *et al.* 2015), and the “corticeira” *Erythrina speciosa* Andrews (Fabaceae) in the state of Rio de Janeiro (ZANUNCIO *et al.* 2015). This species has also been reported on exotic species used for forestry in Brazil, such as the silk oak *Grevillea robusta* (Cunn) (Proteaceae) in the state of São Paulo (SANTANA *et al.* 2005), in the eucalyptus *Eucalyptus cloeziana* F. Muell. (Myrtaceae), in Minas Gerais (MENEZES *et al.* 2012), and the teak *Tectona grandis* Linn. F. (Verbenaceae), also in Minas Gerais (TAVARES *et al.* 2018). Since all developmental stages of *A. reticulatum* (eggs, nymphs, and adults) have been found in *D. alata*, these findings indicate that this host is suitable for the development of the insect. The fact that *A. reticulatum* was found on only one of the *baruzeiro* plants analyzed may be related to possible resistance or pseudo-resistance by the non-infested plant. However, these factors were not evaluated in this study.

Aetalion reticulatum has already been found in mutual association with ant species of the genus *Camponotus* in several cultivated areas in Brazil (SANTANA *et al.* 2005; SANTOS *et al.* 2015; ZANUNCIO *et al.* 2015; CASTRO & MALTOVÃO 2019a, 2019b); this corroborates the results of this study, in which the presence of *C. crassus* foraging the honeydew expelled by the leafhoppers was verified, with the ants protecting the leafhopper colony from natural enemies. This type of interaction was observed by RANDO & LIMA (2010), who found *Camponotus rufipes* (Fabr.) (Hymenoptera: Formicidae) and *C. crassus* in colonies of *A. reticulatum* in the clove basil *Ocimum gratissimum* L. (Lamiaceae). These authors observed that



Figure 1. Nymphs and adults of *Aetalion reticulatum* in mutual association with *Camponotus crassus* (A) and female of *A. reticulatum* protecting an egg spawning (B) in a *baruzeiro* plant (*Dipteryx alata*) (C) in Monte Carmelo, Minas Gerais, Brazil.

the ant species used their antennae and tarsus to stimulate the abdomen of the leafhoppers, causing them to expel the honeydew droplets from which they fed.

Besides ants, mutual association has been observed between *A. reticulatum* and bee species of the genus *Trigona* (Hymenoptera: Apidae) (VIEIRA *et al.* 2007; ODA *et al.* 2009; CASTRO & MALTVOÁO 2019b; CASTRO *et al.* 2019) and with the wasp *Synoeca septentrionalis* Richard (Hymenoptera: Vespidae) (RAMONI-PERAZZI *et al.* 2006).

This study did not assess the presence of natural enemies of *A. reticulatum* adults. Further studies of the natural enemies of *A. reticulatum* in Minas Gerais are necessary since parasitoid eggs belonging to species of the Myrmaridae and Trichogrammatidae families and a parasitoid nymph belonging to a species of the Encyrtidae family have already been reported (SILVA *et al.* 1968; SUGONJAEV & TRJAPITZIN 1988; VIGGIANI 1992; TRIAPITSYN *et al.* 2010; SANTOS & COSTA 2019), in addition to the thrip species *Aulacothrips dictyotus* Hood (Thysanoptera: Heterothripidae), an ectoparasite of nymphs and adults (Izzo *et al.* 2002).

Future studies can better elucidate the association found between the honeydew-producing leafhopper and the *baruzeiro* in the Cerrado of Minas Gerais to determine the factors that lead to the insect's attack, as well as the possible damage caused to the plants. This can be done through constant monitoring, especially in places where this plant naturally occurs. The present study can provide a basis for such studies as it provides novel information on the distribution and host plants of *A. reticulatum* in the state of Minas Gerais.

ACKNOWLEDGMENTS

We thank Prof. Dr. Wilson Sampaio de Azevedo Filho (Universidade de Caxias do Sul) for confirming the identification of the Aethalionidae species and Dr. Jacques Hubert Charles Delabie (Centro de Pesquisas do Cacau - CEPEC/CEPLAC) for assisting the identification of the Formicidae species.

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Suggestion citation:

Souza, JS & J. Boscardin, 2020. Occurrence of *Aetalion reticulatum* (Linnaeus) (Hemiptera: Aethalionidae) on *Dipteryx alata* Vogel (Fabaceae) in Minas Gerais, Brazil. EntomoBrasilis, 13: e930.

Available in: doi: [10.12741/ebrasilis.v13.e930](https://doi.org/10.12741/ebrasilis.v13.e930)

