

First report of *Aethalion reticulatum* (Linnaeus, 1767) (Hemiptera: Aethalionidae) infesting plants of *Coffea arabica* (Linnaeus, 1753) (Rubiaceae)

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ABSTRACT

Coffee has great socio-economic importance, and in this scenario, Brazil stands out as the largest producer and exporter of coffee beans. However, the coffee crop is susceptible to the attack of several insect pests, the main ones being the coffee berry borer *Hypothenemus hampei* (Coleoptera: Curculionidae: Scolytinae) and the leaf miner *Leucoptera coffeella* (Lepidoptera: Lyonetiidae), which can cause great economic losses if left unchecked. However, other pest arthropods may be present in the crop, and their identification and evaluation of its importance are essential for the elaboration of mitigation measures. Up to date, the presence of the leafhopper *Aethalion reticulatum* (Hemiptera: Aethalionidae) in *Coffea arabica* (Rubiaceae) plants has not been reported in the literature. Thus, the present study aimed to describe the occurrence of *A. reticulatum* in *Coffea arabica* plants on the Campus of the Federal University of Lavras (UFLA), Lavras, Minas Gerais, Brazil.

Key words: Fruit leafhopper; Insect pest; Coffee crop; Infestation.

1 INTRODUCTION

Brazil is the largest producer and exporter of coffee beans in the world, and Minas Gerais State is the main producing region, responsible for approximately 55% of national production (Companhia Nacional do Abastecimento - CONAB, 2021). In the 2019/2020 harvest, the country exported 44.67 million bags with revenue of 5.6 billion dollars (Conselho dos Exportadores de Café do Brasil - CECAFÉ, 2020). Coffee production occupies a total of 2.71 million hectares with an estimated production of 49.5 million 60 kg bags and an average productivity of 28.24 per hectare (CONAB, 2021). However, this production can be reduced by several factors, among which stands out the attack of insect pests.

The leaf miner *Leucoptera coffeella* (Guérin-Mèneville Perrottet, 1842) (Lepidoptera: Lyonetiidae) and the coffee berry borer *Hypothenemus hampei* (Ferrari, 1867) (Coleoptera: Curculionidae: Scolytinae) are the main insect pests of the coffee crop in Brazil and they are generally controlled with insecticides. The frequent use of insecticides from the chemical groups of organophosphates, pyrethroids and carbamates to control these pests can lead to outbreaks of secondary pests such as the red mite *Oligonychus ilicis* (McGregor, 1917) (Acari: Tenuipalpidae) (Souza et al., 1998).

Another secondary pest of coffee is the mite *Brevipalpus phoenicis* (Geijskes, 1939), known to be a vector of the coffee ring spot virus (CoRSV), which in very favorable conditions, this disease can cause intense leaf loss. Sucking insects such as the *Quesada gigas* (Olivier, 1790), *Carineta*

fasciculata (Germar, 1830), *Fidicina pronoe* (Walker, 1850), *Carineta spoliata* (Walker, 1858), *Carineta matura* (Distant, 1892) cicadas (Hemiptera: Cicadidae), and the root insects *Dysmicoccus cryptus* (Hempel, 1918), green scale *Coccus viridis* (Green, 1889) (Hemiptera: Coccidae), citrus mealybug *Planococcus citri* Risso, 1813 (Hemiptera: Pseudococcidae) and the citrus orthezia *Orthezia praelonga* Douglas, 1891 (Hemiptera: Ortheziidae) are also found in the crop, but occur occasionally. Some chewing insects like the imperial moth *Eacles imperialis* (Walker, 1856), *Lonomia circumstans* Walker, 1855 (Lepidoptera: Saturniidae), bagworm *Oiketicus kirbyi* (Lands-Guilding, 1827) (Lepidoptera: Psychidae), fuller rose beetle *Naupactus cervinus* (Boheman, 1840) (Coleoptera: Curculionidae), termites *Cornitermes* sp. and *Procornitermes* sp. (Isoptera: Termitidae) are also found in coffee plants as secondary pests (Gallo et al., 2002).

Despite the large number of pests associated with coffee, the presence of the leafhopper *Aethalion reticulatum* (Linnaeus, 1767) (Hemiptera: Aethalionidae) has not been reported in the crop until now. It is a piercing and sap-sucking insect which adults and nymphs feed on plant stem (Vanin et al., 2008) of different hosts, mainly fruit, such as cashew, citrus, fig, mango and tamarind (Gallo et al., 2002). Furthermore, this species can be an important pest of orchards because impair the development of plants and the formation of fruits or new shoots and the plant can finally die (Araújo et al., 2010). Also, this species has a gregarious behavior, i.e., and lives in colonies formed by young apterous insects and winged adults. This species has been identified in different hosts such as *Dipteryx*

alata (Souza; Boscardin, 2020), *Morinda citrifolia* (Castro; Montalvão, 2019), *Triplaris americana* (Pires et al., 2015), *Erythrina speciosa* (Zanuncio et al., 2015), and *Eucalyptus cloeziana* (Menezes et al., 2012). The adults measure approximately 10 mm in length, have a rust-brown color and the venation of their wings are greenish with protruding ribs (Gallo et al., 2002; Santos; Creão Duarte; Lunz, 2015). Rando and Lima (2010) observed that the colonies of *A. reticulatum* were preferentially found in the basal part of the tree, next to 40-mm diameter branch bifurcations, with low incidence of sunlight, and even if stimulated, they did not endorse the colony's gregarious habit.

The biological cycle of *A. reticulatum* lasts about 110 days (egg to adult), with the nymphal stage lasting approximately 45 days, going through five instars, which allows the development of up to three generations per year. The average longevity of adult insects is 60 days, during which the females lay up to 100 eggs, which are deposited in masses on the surface of the plant tissue and surrounded by a brownish or grayish substance for protection. Nymphs of *A. reticulatum* emerge after 30 days of oviposition, and during the embryonic period, the females protect the eggs while remaining on the mass (Vieira et al., 2007).

The leafhoppers have a filter chamber digestive system type, which allows assimilation of aminoacids and elimination of excess plant sap (water and sugar) in the form of "honeydew", used as food by the sooty mold fungus *Capnodium* sp. The presence of sooty mold on plant tissue causes a reduction in photosynthesis by reducing absorption capacity and the production of photoassimilates by plants, in addition to hindering transpiration and respiration, leading to reduced productivity. The "honeydew" consists of sugars such as glucose, fructose and sucrose, aminoacids, lipids, starch, vitamins and minerals, which attracts other insects to the host plant, such as ants belonging to the genus *Camponotus* (Fowler, 1992). These hymenopterans protect the colonies of *A. reticulatum* against predators and in return maintain their food source (Blüthgen et al., 2000). There are also other symbiotic insects such as the wasp *Synoeca septentrionalis* Richard, 1978 (Hymenoptera: Vespidae) and stingless bees belonging to the Meliponini tribe, especially *Trigona* spp. (Santos; Creão-Duarte; Lunz, 2015; Rando; Lima, 2010).

Thus, the objective of the present work is to describe for the first time the occurrence of the *A. reticulatum* leafhopper in *Coffea arabica* plants in the state of Minas Gerais.

2 MATERIAL AND METHODS

Leafhoppers infesting coffee plants were identified in an area located at latitude 21°13'36.47" South, longitude 44°57'40.35" West and altitude of 975 meters above sea level, in the city of Lavras, Minas Gerais, Brazil.

The planting of the area was carried out in January 2016, with seedlings of the cultivar "Mundo Novo 379-19" on the Campus of the Federal University of Lavras (UFLA) (Figures 1A and B). The spacing was 3.6 meters between the rows and 0.75 meters between plants. In October 2017, one year and ten months after planting, a colony of *A. reticulatum* was observed in coffee plants.

The images of the insects were obtained using an Olympus® E-410 digital camera, and the adult leafhoppers were taken to the Ecotoxicology Laboratory of the Entomology of the Federal University of Lavras for identification.

3 RESULTS

Leafhoppers were identified as *A. reticulatum*. The analyzed plants had flowers (Figures 1A and 1B) and nymphs and adults of the insect were found. The insects were found mainly in the youngest branches of the plant and close to the fruits. The colony was formed by 50 insects, being 30 nymphs and 20 adults (Figure 1C). The adults and nymphs suck the sap from the plant, damaging the development of fruits and shoots, and in high infestations can kill the plant. *Camponotus* spp. ants (Hymenoptera: Formicidae) were also found in association with the leafhoppers in this study.

4 DISCUSSION

Recognized as an important fruit pest insect, *A. reticulatum* has a wide geographic distribution, being found in Central American and South American countries (Marques, 1928). In Brazil, there are reports of the occurrence of *A. reticulatum* in three states in the southern region (PR, SC and RS), four in the southeast region (MG, ES, SP and RJ), as well as in other states such as Bahia, Ceará and Amazonas (Santana et al., 2005).

However, reports in the literature demonstrate the occurrence of this insect in other host plants such as *Grevillea robusta* Allan Cunningham, 1830 (Proteaceae), known as southern silky oak, a plant originally from Australia and cultivated as an ornamental plant and for windbreak and shading for agricultural crops (Santana et al., 2005). In Acre, a state in northern Brazil, Santos, Creão-Duarte and Lunz (2015) described the occurrence of *A. reticulatum* in a plant of *Euterpe oleracea* Martius, 1824 (Arecaceae), popularly known as "açai", of great economic importance for the region. Zanuncio et al. (2015) observed the occurrence of this insect in the state of Rio de Janeiro in *Erythrina speciosa* Andrews (Fabaceae), an ornamental plant known as coral tree. Rando and Lima (2010) reported the presence of this leafhopper in *Ocimum gratissimum* L. (Lamiaceae), widely used as a medicinal plant due to its therapeutic potential, as well as



Figure 1: *Aethalion reticulatum* (Linnaeus, 1767) (Hemiptera: Aethalionidae) and *Coffea arabica* (Linnaeus, 1753) (Rubiaceae). (A) Coffee crop cultivation Mundo Novo 379-19, (B) Inflorescence of *C. arabica*, (C and D) colony of *A. reticulatum* in the *C. arabica* plant and *Camponotus* spp. ants.

Menezes et al. (2013) reported the presence of this Hemiptera in *Vernonia condensata* Baker, 1875 (Asteraceae), a Brazilian medicinal plant, commonly known as figatil. The presence of *A. reticulatum* feeding on plants of *Eucalyptus cloeziana* F. Muell, 1878 (Myrtaceae) was reported by Menezes et al. (2012). This widespread occurrence demonstrates the potential for infestation of this insect pest not only on fruit trees, but also on other hosts, and it may become an important pest in other crops, such as coffee crop (Figure 1).

Therefore, *A. reticulatum* has been detected in coffee crop for the first time and it has potential to become an important pest of this crop. Several pest management strategies can be used against the *A. reticulatum*, such as monitoring the infested and nearby areas for the occurrence and possible population fluctuation of the insect, to verify the need to implement control measures, as well as to identify the presence of its natural enemies that will help in the regulation of the population density of the pest insect in the crop.

For monitoring of *A. reticulatum* is possible to use traps, as it is used for the monitoring and control of coffee berry borer. Fernandes et al. (2011) evaluated the levels of economic damage caused by this insect using red traps with an alcohol mixture. The use of these traps allows the detection of the beginning of coffee berry borer infestation in the field, and when the first adults initially arrive in the cultivated area; in that way, their use helps in the decisions and adoption of pest management strategies in the crop. Another study conducted by Fernandes et al. (2014), using red PET-bottle traps reduced the percentage of drilled berries in 57%. However, the use of these traps as the only method of control does not solve the problem, and other strategies is necessary (Fernandes et al., 2014; Infante, 2018). In view of this, new studies should be carried out for the development of attractive traps for *A.*

reticulatum to monitor and even control this leafhopper in coffee crop.

Insecticides are widely used to control pests. However, there are no products registered for the control of this leafhopper in coffee crop. Nevertheless, phosphorus insecticides, carbamates or growth regulators are recommended, as chemical control options of this leafhopper in other crops (Gallo et al., 2002).

The presence of natural enemies is also important to manage this pest. A research carried out by Conceição, Guerreira-Filho and Gonçalves (2005) in which the authors observed the population fluctuation of *L. coffeella* in different coffee cultivars, as well as the presence of natural enemies. The researchers reported two peaks of leaf miner infestation throughout the year, which provided growers with important information for planning insect control strategies. In the literature are reported as natural enemies of leafhopper, *Pterygogramm marquesi* (Brèthes) (Hymenoptera: Trichogrammatidae) (Sutil; Santos, 2020), *Aulacothrips dictyotus* (Hood) (Thysanoptera: Heterothripidae) (Izzo; Pinent; Mound, 2002), and *Uscanoidea silvestrii* (Viggiani) (Hymenoptera: Trichogrammatidae) (Viggiani, 1992).

This note reports the first occurrence of *A. reticulatum* insects in *C. arabica*, in Lavras city, Minas Gerais State, Brazil. Our observations show that this plant is a potential host of this leafhopper, described as an insect pest in agricultural crops, and for this it is essential to expand our knowledge about your life cycle in the coffee crop, as well as of control measures.

5 CONCLUSION

This is the first report of the occurrence of *A. reticulatum* in the coffee crop.

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