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Nota Técnica

First record of the *Leptocybe invasa* Fisher & La Salle (Hymenoptera: Eulophidae) in Sergipe, Brazil

Primeiro registro da *Leptocybe invasa* Fisher & La Salle (Hymenoptera: Eulophidae) em Sergipe, Brasil

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ABSTRACT

Leptocybe invasa is a fast-spreading alien pest infesting eucalyptus in several countries. This study examined the damage caused by the gall wasp, recorded in eucalyptus plants in the municipalities of Itaporanga D'Ajuda and São Cristóvão, state of Sergipe, Northeastern Brazil.

Keywords: Forest pests; Gall wasp; Exotic pests; Forest entomology

RESUMO

Leptocybe invasa é uma praga exótica de rápida disseminação que infesta o eucalipto em vários países. Este estudo analisou os danos causados pela vespa-da-galha, registrados em plantas de eucalipto nos municípios de Itaporanga D'Ajuda e São Cristóvão, estado de Sergipe, Nordeste do Brasil.

Palavras-chave: Pragas florestais; Vespa-da-galha; Pragas exóticas; Entomologia florestal

1 INTRODUCTION

Eucalyptus species (Myrtaceae) are an important option for the wood, energy, paper and cellulose industries, due to their high productive capacity and adaptability to different regions (Abreu; Marino; Mesquita; Ribeiro, 2007). In Brazil, eucalyptus plantations in 2020 totalled 7.47 million hectares, with average productivity of 36.8 $m^3.ha^{-1}.year^{-1}$ (IBÁ, 2021). However, this extensive area planted in the country, triggered phytosanitary problems, due to the introduction of exotic insects (Almeida; Silva; Silva; Costa; Laia, 2018).

The gall wasp, *L. invasa* Fisher & La Salle, 2004 (Hymenoptera: Eulophidae), is a gall-inducing pest of several *Eucalyptus* species of commercial importance, and is extensively dispersed worldwide (Dittrich-Schroder; Hoareau; Hurley; Wingfield; Lawson; Nahrung; Slippers, 2018). Being found in Asia (India (Kulkarni, 2010), Cambodia, Vietnam (Thu; Dell; Burgess, 2009) and Thailand); Oceania (New Zealand); Middle East (Israel, Syria (Mendel; Protasov; Fisher; La Salle, 2004), Iran, Iraq, Jordan, Lebanon and Turkey (Aytar; Dagdas; Duran, 2011); Africa (Morocco, Algeria, Kenya (Mendel; Protasov; Fisher; La Salle, 2004), Uganda (Nyeco; Mutitu; Day, 2009), and Tanzania); South Africa and Europe (Greece, Italy, France, Spain and Portugal (Branco; Franco; Valente; Mendel, 2006)); among other countries (Nugnes; Gebiola; Monti; Gualtieri; Giorgini; Wang; Bernardo, 2015).

The gall wasp, *L. invasa* has been described as a pest of *Eucalyptus* spp. in Asia (India (Kulkarni, 2010), Cambodia, Vietnam (Thu; Dell; Burgess, 2009) and Thailand); Oceania (New Zealand); Middle East (Israel, Syria (Mendel; Protasov; Fisher; La Salle, 2004), Iran, Iraq, Jordan, Lebanon and Turkey (Aytar; Dagdas; Duran, 2011)); Africa (Morocco, Algeria, Kenya (Mendel; Protasov; Fisher; La Salle, 2004), Uganda (Nyeco; Mutitu; Day, 2009), and Tanzania); South Africa and Europe (Greece, Italy, France, Spain and Portugal (Branco; Franco; Valente; Mendel, 2006)); among other countries (Nugnes; Gebiola; Monti; Gualtieri; Giorgini; Wang; Bernardo, 2015). In Brazil, the

occurrence of *L. invasa* has been reported in the states of Bahia (Costa; Berti-Filho; Wilcken; Stape; La Salle; Teixeira, 2008), Rio Grande do Sul (Garlet; Costa; Boscardin; Deponti; Shwengber; Machado, 2013), Minas Gerais (Fernandes; Barcelos; Andrade; Zanuncio, 2014), Goiás (Pereira; Melo; Rodrigues; Dias; Wilcken, 2014), Espírito Santo, Maranhão, Mato Grosso, Mato Grosso do Sul, Pará, Paraná, Pernambuco, São Paulo, Tocantins (Wilcken; Zache; Masson; Pereira; Barbosa; Zanuncio, 2015) e Santa Catarina (Barbosa; Rodrigues; Souza; Puretz; Wilcken; Zanuncio, 2018).

The gall wasp *L. invasa* is relatively small, with 1.1 to 1.4 mm in length, and females reproduce by thelytokous parthenogenesis. Adults of this insect are dark brown with a bright metallic blue coloration (Mendel; Protasov; Fisher; La Salle, 2004). Damage by *L. invasa* includes the formation of galls on leaf veins, petioles and stems of young eucalyptus plants. Intense infestations of this insect can reduce growth and eventually lead to the death of trees (Sangtongpraow; Charernsom, 2019).

The galls caused by *L. invasa* are formed by cellular hyperplasia, likely from substances injected by the female, after oviposition, blocking the normal flow of sap and leading to leaf fall. This damage it can slow the growth and development of trees and even cause death if the number of galls is high enough (Huang; Li; Lu; Zheng; Yang, 2018), consequently, compromising the productivity of susceptible eucalyptus clones (Wilcken; Zache; Masson; Pereira; Barbosa; Zanuncio, 2015). *Eucalyptus* species susceptible to *L. invasa* include *Eucalyptus saligna*, *Eucalyptus grandis*, *Eucalyptus deanei*, *Eucalyptus globulus globulus*, *Eucalyptus nitens*, *Eucalyptus botryoides*, *Eucalyptus camaldulensis*, *Eucalyptus gunnii*, *Eucalyptus robusta*, *Eucalyptus bridgesiana*, *Eucalyptus viminalis* and *Eucalyptus tereticornis* (Thu; Dell; Burgess, 2009; Sankaran, 2008).

The objective of this report is to document the occurrence of *L. invasa* damaging *Eucalyptus* trees in the municipalities of Itaporanga D'Ajuda and São Cristóvão, state of Sergipe, Northeastern Brazil.

2 MATERIALS AND METHODS

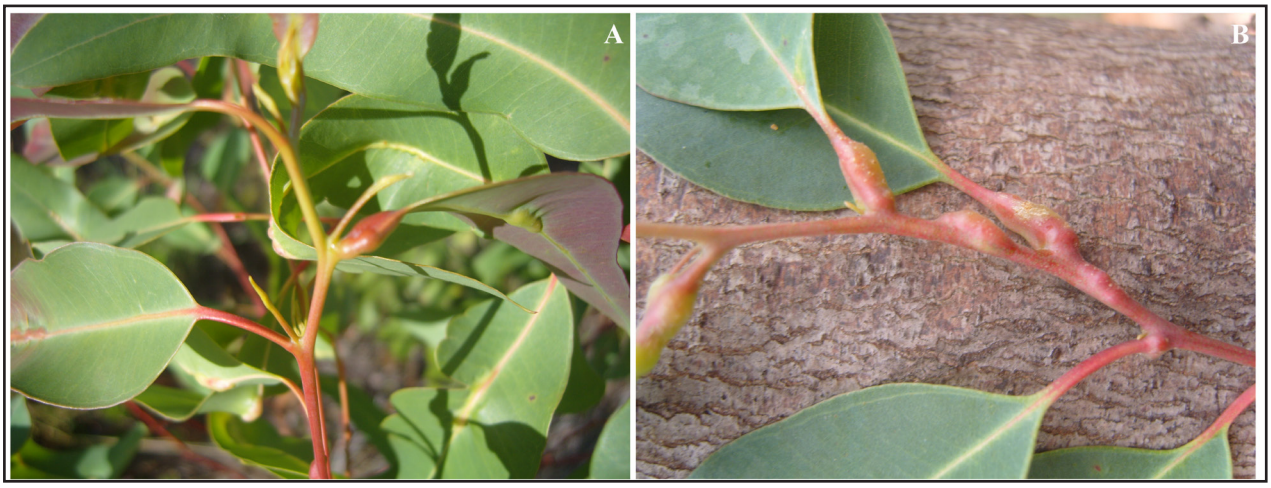
In the state of Sergipe, Northeastern Brazil, *L. invasa* was first observed forming galls and causing damage to trees isolated from hybrid eucalyptus clones at the Campus of the Federal University of Sergipe, in the municipality of São Cristóvão (10°55'S, 37°6'W) in 2011. Later, the gall wasp was detected near the village of Aldeia (11°0'S, 37°18'W) and the District of Caueira (11°12'S, 37°12'W), in the municipality of Itaporanga D'Ajuda, in commercial plantations of different hybrid eucalyptus clones. Oviposition by this insect has been observed on leaves, branches and stems of trees, causing galls typical of this insect pest.

3 RESULTS AND DISCUSSION

The susceptibility of *Eucalyptus* hybrids to *L. invasa* in the Campus of the Federal University of Sergipe varied between the clones. However, those which formed hybrids with Eucalyptus camaldulensis were the most susceptible to the damage caused by the gall wasp.

The eucalyptus plantations in the region of Itaporanga D 'Ajuda were established experimentally with clones BA04, BN41 and BN46 (Castaneda; Paz; Ribeiro; Santos, 2012). Each clone had 120 plants in spacing of 3 x 2.2 meters, totaling 360 plants occupying an area of 0.27 ha. Galls and adults of *L. invasa* were found only in clone BA04 (Figure 1AB). In the Caueira region, the clone was planted in 2012 in an area of 0.87 ha with genetic material from the state of Minas Gerais, and 100% of the plants were strongly attacked by *L. invasa* and had their growth sharply reduced. Gall formation was evaluated in all plants.

Figure 1 – *Leptocybe invasa* (Hymenoptera: Eulophidae): galls



Source: Authors (2011)

Galls of *L. invasa* were found in the three areas, and the exit holes indicate the emergence of adults of this pest (Figure 2AB). Adult wasps were observed during the day laying eggs on leaf petioles or apical branches, as reported by Mendel, Protasov, Fisher and La Salle (2004). Formation and development of galls in the plant occur due to the larval development of *L. invasa* upon lodging and feeding in a cavity within the plant (Kulkarni, 2010).

Figure 2 – *Leptocybe invasa* (Hymenoptera: Eulophidae): holes indicating adult emergence from the plant

Source: Authors (2011)

Genetic traits of eucalyptus species, microclimate variables and management can affect the number of galls and the abundance of *L. invasa* adults (Nyeko; Mutitu; Otieno; Ngae; Day, 2010). Selection for resistant or less susceptible genotypes has the potential to mitigate the damage caused by the galling insect, considering that there is variation in resistance across species, origins, genotypes and/or clonal varieties in *Eucalyptus* (Mendel; Protasov; Fisher; La Salle, 2004; Nyeko; Mutitu; Otieno; Ngae; Day, 2010; Luo; Arnold; Lu; Lin, 2014).

Insecticides such as dimethoate, imidacloprid, chlorpyrifos, monocrotophos, lambda-cyhalothrin, profenofos, phosphamidon, triazophos, thiamethoxam and phorate can reduce gall formation by *L. invasa* (Kulkarni, 2010). Chemical control, however, should only be performed in very young plantations, preferably with systemic insecticides of low impact on non-target organisms (Aquino; Botto; Loiácono; Pathauer, 2011). On the other hand, chemical control is not widely accepted due to its low efficacy, negative effects on biodiversity and environmental pollution, making this method an unviable option when applied in large areas (Zheng; Huang; Dong; Guo; Li; Yang; Yang; Lu, 2016; Souza; Barbosa; Passos; Castro; Zanuncio; Wilcken, 2018).

Compared with other control methods, biological control is considered an attractive alternative due to the ecological and economic benefits (De Clercq; Mason; Babendreier, 2011). In this respect, the use of parasitoids constitutes an important management strategy for *L. invasa* (Dittrich-Schröder; Wingfield; Hurley; Slippers, 2012). In Brazil, the parasitoid *Selitrichodes neseri* Kelly & La Salle, 2004 (Hymenoptera: Eulophidae) was successfully released and established in eucalyptus plantations (Masson; Tavares; Lopes; Souza; Ferreira-Filho; Barbosa; Wilcken; Zanuncio, 2017), demonstrating the potential of this natural enemy for the biological control of *L. invasa* (Kelly; La Salle; Harney; Dittrich-Schröder; Hurley, 2012).

4 CONCLUSIONS

There are no known highly efficient strategies to prevent damage from and control *L. invasa*. Therefore, research is warranted to discover tools for its control and to examine its rapid spread throughout the Brazilian territory.

The report of the occurrence of *L. invasa* in the state of Sergipe confirms the propagation capacity of this insect pest and its adaptability to different regions, contributing to information about the geographic distribution of this eucalyptus pest in Brazil.

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