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**Scientific Notes**

# First record of damage caused by *Strepsicrates smithiana* Walsingham (Lepidoptera: Tortricidae) to eucalyptus in Brazil

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**Abstract** - This study reports, for the first time, the damage caused by *Strepsicrates smithiana* Walsingham in eucalyptus plantations in Brazil. The outbreaks were observed from June to September 2024, in the northeast region of Bahia, Brazil. The damage occurred on young plants of eight eucalyptus clones between 40 and 90 days old, across an area of approximately 1,000 ha. Plants with a high incidence of caterpillars exhibited canopy malformation, loss of apical dominance and stunted growth. The damage caused by the pest affected plant growth, stand uniformity and may have the potential to reduce forest productivity.

## Primeiro registro de danos causados por *Strepsicrates smithiana* Walsingham (Lepidoptera: Tortricidae) em eucalipto no Brasil

**Resumo** - Este trabalho reporta, pela primeira vez, os danos causados por *Strepsicrates smithiana* Walsingham em plantações de eucalipto no Brasil. Os surtos foram observados de junho a setembro de 2024, na região nordeste da Bahia, Brasil. Os danos foram observados em plantas jovens de oito diferentes clones de eucalipto, com idades entre 40 e 90 dias, em área de aproximadamente 1,000 ha. Plantas com alta incidência de lagartas apresentaram malformação das copas, perda da dominância apical e crescimento atrofiado. Os danos causados pela praga afetaram o crescimento das plantas, uniformidade do plantio e tem potencial para reduzir a produtividade florestal.

In Brazil, eucalyptus plantations cover approximately 7.8 million hectares, representing 76% of all planted forests in 2023 (Indústria Brasileira de Árvores, 2024). Among the pests affecting eucalyptus, caterpillars are one of the most significant ones (Lemes & Zanuncio, 2021), including several species that can cause great damage to plantations of various ages. On the other hand, few caterpillar species are known to damage eucalyptus seedlings in nursery, with emphasis to the leafroller caterpillar *Strepsicrates smithiana* Walsingham (Mafia et al., 2023).

In June 2024, leaf damage caused by *S. smithiana* was detected for the first time in young eucalyptus plantations. It appears that the pest spread from nurseries to the field via seedlings with caterpillar eggs. In addition to the eggs, caterpillars in different instars and insects in the adult phase were observed. In Brazil, *S. smithiana* was first observed in *Psidium cattleianum* Sabine, commonly known as “araçá”. In this first report, “araçá” plants showed symptoms of leafroller in orchards and commercial nurseries, in the state of Rio Grande do Sul, southern Brazil (Diez-Rodríguez et al., 2016).

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*S. smithiana* has been recorded on plants from the Myricaceae and Myrtaceae families, including eucalyptus (Candelária et al., 2018; Mafia et al., 2023), as well as host species *Myrica pavonis* C. DC., *M. faya* Aiton, *M. cerifera* L., *Psidium guajava* L., and *P. cattleianum* Sabine (Carabalí-Muñoz et al., 2015; Canacuán-Nasamuez & Carabalí-Muñoz, 2015; Diez-Rodríguez et al., 2016). In the Americas, this lepidopteran species has been reported in Ecuador (Razowski & Wojtusiak, 2009), Bermuda (Ferguson et al., 1991), Chile (Vargas, 2012), Colombia (Carabalí-Muñoz et al., 2015), and the United States (Peña et al., 1999).

Besides *S. smithiana*, two other species from the same genus are important pests of eucalyptus. In Indonesia, *S. semicanella* Walker is an important pest causing substantial damage to young eucalyptus trees (Srikumar et al., 2020a, 2020b). In New Zealand and Australia, *S. macropetana* Meyrick attacks juvenile foliage of at least 15 *Eucalyptus* species, with the damaging stage involving feeding on shoot tips, buds and developing flowers, which are bound together in webs. Leafroller caterpillars feed on the leaves and shoot tips of young eucalyptus trees, severely affecting their development and growth (Mauchline et al., 1999). Severe infestations of *S. semicanella* on eucalyptus trees resulted in a height loss of 30-40 cm within the first three months after planting in Riau, Indonesia (Srikumar et al., 2022).

In Brazil, the occurrence of leafroller caterpillars was assessed by sampling. For this purpose, in each eucalyptus plantation compartment, five linear plots of ten plants were evaluated. In Brazilian plantations, the outbreak was observed between June and September, with a population peak in August, in Northeast Bahia State. Caterpillar outbreaks were observed in 1,028 hectares of plantations, distributed across of the municipalities of Alagoinhas, Entre Rios, Inhambupe and Itanagra, affecting 444, 93, 222, and 269 hectares, respectively. There are reports of leafroller caterpillars occurrences in other regions, especially in northeastern Brazil, but there is a lack of information in the literature. The climate in the region is classified as Equatorial savannah with dry summer (As) and Equatorial rainforest, fully humid (Af) according to the Köppen climate classification system (Köppen & Geiger, 1936). The region experiences four bioclimatic types from the coast inland: humid, sub-humid humid, sub-humid dry and semi-arid. The average annual temperature is around 25°C, with small monthly fluctuations, the average maximum being 29°C and the average minimum 20°C. Rainfall is concentrated from April to July, with a minor secondary peak in November/December. Annual precipitation ranges from 700 to 2000 mm, from inland to the coast. When compared to the occurrence of leafroller in other regions, Diez-Rodríguez et al. (2014) observed a higher population peak of *S. smithiana* in “araçá” plants in Southern Brazil during January and March in new field shoots. In eucalyptus plantations on Indonesia, the other specie of the S*trepsicrates,* the seasonality of *S. semicanella* revealed that the pest was present throughout the year, with high incidence in April, May, June and July at 11.1, 13.9, 13.1 and 12.9%, in relation to the plantings carried out in the year, respectively. Incidence was lower in September at 4.9% (Srikumar et al., 2022). In future work, it is important to evaluate which climatic conditions may favor the occurrence of the pest. According to the current report, prevalence was observed during periods of greater rainfall.

The outbreak of *S. smithiana* in Brazil occurred basically in young plantations between 40 and 90 days old. The caterpillars fed on new leaves and shoots, affecting the shape and initial development of the attacked plants (Figure 1). In Indonesia, the incidence of *S. semicanella* on eucalyptus plants began two weeks after planting, with infestation increasing over three weeks. At this stage, early larval instars typically occurred inside buds, on shoot tips, or between the apical junctions of paired leaves. Incidence of *S. semicanella* reached a peak at 5 to 11 weeks after planting, with 90% and 84% incidence, respectively. Incidence began to decline from 15 weeks after planting and further reduced by 21 weeks, mainly concentrated in the lower part of the plants, with no impact on tree growth (Srikumar et al., 2022).

The adult *S. smithiana* is a small moth with a wingspan of 14-15 mm and forewing length of 4.5-6.0 mm. The caterpillar’s body were generally yellow or yellow-greenish, with possible variations due to diet, as observed in eucalyptus clones with reddish shoots promoting the development of similarly colored caterpillars. The body is cylindrical with simple setae running from one end to the other, as described by Carabalí-Muñoz et al. (2015). Caterpillars were collected in the field and their measurements were determined (50 samples). The caterpillar length ranging from 10 to 15 mm, as reported by Mafia et al. (2023). The moth is small, measuring approximately 1 cm in length, with closed wings at rest, displaying green and dark green patterns.

The biology of *S. smithiana* was studied on guava, eucalyptus and “araçá” plants under controlled environment conditions. On guava, the larval stage


**Figure 1.** Damage and presence of different stages of *Strepsicrates smithiana* in eucalyptus plantations: (A) appearance of young plant in the field with shoot damage (arrows) caused by the leafroller caterpillar; (B) rolling of eucalyptus leaves; (C) detail of the damaged plant growth tip; (D) presence of the leafroller caterpillar on the tip; (E) dorsal view of the adult; and (F) side view of the adult insect.

presented five phases and the total duration of the biological cycle was 42.93 ± 1.68 days, with an incubation period of 5.07 ± 0.37. The larval stages, prepupa, pupa and adult had an average duration of 18.17 ± 2.03; 3.27 ± 0.45; 10.57 ± 1.04 and, 5.87 ± 1.2 days, respectively (Canacuán-Nasamuez & Carabalí-Muñoz, 2015). On eucalyptus leaves, the larval stage exhibited five instars. The pre-pupal stage lasted one day, and the pupal stage lasted 10.6 days, with the adult stage lasting 8.4 days, totaling 33.1 days from the 1st instar to the end of the adult stage (Candelária et al., 2018). On “araça” leaves, the durations of the egg, larval and pupal stages were 4.1, 21.9, and 11.5 days, with survival rates of 74.3, 51.7 and 55.4%, respectively. The biological cycle was 43.4 days, with an average survival of 21.3%. Females laid an average of 135 eggs, with a pre-oviposition period of 5.9 days. The average longevity of males and females was 16.5 and 17.6 days, respectively, with a sex ratio of 0.5. Additionally, a population increase capacity of 32 times per generation was observed (Diez-Rodríguez et al., 2014, 2016). Another congeneric species, *S. macropetana*, which causes damage to plantation forestry and nursery stock

throughout New Zealand and Australia, developed through five instars and had an overall developmental duration of 46.2 days (Mauchline et al., 1999).

In Brazil, the outbreak was observed in plantations of eight different eucalyptus clones, covering approximately 1,028 ha. All clones affected by the pest are hybrids of *Eucalyptus grandis* W. Hill x *Eucalyptus urophylla* S. T. Blake. Although an initial preference for certain clones was observed, at the end of the period favorable for the pest, damage occurred in all clones planted in the region. The evaluated plots (5 plots of 10 plants) showed an average incidence of caterpillars in 82.6% of the plants evaluated, with an average severity of 2.7 caterpillars per attacked plant. The affected plants remained alive, but they showed deformities in their growth tips, including canopy malformation, loss of apical dominance and stunted growth. These areas will be continuously monitored to better understand the biological aspects of the pest, epidemiological parameters and potential impacts on forest productivity to define integrated management strategies in the future.

## Conclusion

The outbreak of leafroller caterpillar has the potential to adversely impact on the quality and productivity of eucalyptus plantations, if adequate integrated management measures are not implemented. These measures should begin in the nursery, through continuous monitoring and control of the leafroller caterpillar, to prevent the spread of the pest to the field. Monitoring of the pest should occur throughout the year, with particular attention to young plantations and the rainy season, especially in the northeast region of Bahia State, Brazil.

## Conflict of interest

The authors have no conflict of interest to declare.

## Authors' Contributions

**Reginaldo Gonçalves Mafia**: conceptualization, formal analysis, investigation, methodology, writing - original draft, writing - review & editing. **Wagner Calixto de Castro Morais**: conceptualization, investigation, methodology, writing - review & editing. **Leonardo Sarno Soares Oliveira**: conceptualization, investigation, methodology, writing - review & editing. **Talita Alves Menezes**: investigation, writing - review & editing. **Lucas Augusto Abra Vieira**: investigation, writing - review & editing. **Srikumar Koda Kkadan**: writing - review & editing.

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