

First record of *Aricoris campestris* (Bates, 1868) (Lepidoptera: Riodinidae), and occurrence of harmful insects in dragon fruit (*Hylocereus polyrhizus*) cultivation in the Sertão Pernambucano, Brazil

Primeiro registro de Aricoris campestris (Bates, 1868) (Lepidoptera: Riodinidae), e ocorrência de insetos danosos na cultura da pitaiá (*Hylocereus polyrhizus*) no Sertão Pernambucano, Brasil

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RESUMO

A pitaiá (*Hylocereus polyrhizus*) é uma cactácea com grande destaque no mercado de frutas atual. Possui elevada rusticidade e tolerância às condições edafoclimáticas adversas possuindo potencial para o seu cultivo nas regiões semiáridas. Apesar de ser pouco acometida por pragas, a sua exploração comercial pode ser prejudicada se medidas de controle não forem realizadas. Ademais, produtos fitossanitários não foram registrados para o controle de pragas nesta cultura. Devido a isto, o conhecimento de insetos que acometem esta cultura é de fundamental importância para o seu correto controle e o sucesso produtivo do pomar. O objetivo deste estudo foi realizar um levantamento entomofaunístico visando avaliar a ocorrência de insetos danosos em um pomar de pitaiá implantado no sertão Pernambucano. A avaliação ocorreu por meio de registros fotográficos, coleta e identificação dos insetos por meio de dados na literatura. Os registros e coletas foram realizadas unicamente no período diurno. Os insetos observados foram: lagarta *Aricoris campestris* (Bates, 1868) (Lepidoptera: Riodinidae), formiga *Atta sexdens rubropilosa* (Forel, 1908) (Hymenoptera: Formicidae), arapuá *Trigona spinipes* (Fabricius, 1793) (Hymenoptera: Apidae), pulgão *Myzus persicae* (Sulzer, 1776) (Hemiptera: Aphididae). Este trabalho relata o primeiro registro de lagartas de *A. campestris*, formiga, arapuá e pulgão causando danos na pitaiá.

PALAVRAS-CHAVE: fruta-do-dragão; cactácea; semiárido; pragas agrícolas.

ABSTRACT

The pitai tree (*Hylocereus polyrhizus*) is a cacti with great prominence in the current fruit market. It has high rusticity and tolerance to adverse soil and climate conditions and has potential for cultivation in semi-arid regions. Despite being rarely affected by pests, its commercial exploitation can be harmed if control measures are not carried out. Furthermore, phytosanitary products have not been registered for pest control in this crop. Due to this, knowledge of the insects that affect this crop is of fundamental importance for their correct control and the productive success of the orchard. The objective of this study was to carry out an entomofauna survey aiming to evaluate the occurrence of harmful insects in a dragon fruit orchard located in the Pernambuco hinterland. The evaluation took place through photographic records, collection and identification of insects using data in the literature. Records and collections were carried out only during the day. The insects observed were: caterpillar *Aricoris campestris* (Bates, 1868) (Lepidoptera: Riodinidae), ant *Atta sexdens rubropilosa* (Forel, 1908) (Hymenoptera: Formicidae), Stingless bee arapuá *Trigona spinipes* (Fabricius, 1793) (Hymenoptera: Apidae), aphid *Myzus persicae* (Sulzer, 1776) (Hemiptera: Aphididae). This work reports the first record of *A. campestris*, ant, arapuá and aphid caterpillars causing damage to the dragon fruit.

KEYWORDS: dragon fruit; cactaceae; semiarid; agricultural pests.

The dragon fruit plant (*Hylocereus* sp.) is native to Mexico (LONE et al. 2020) and was introduced to Brazil in 1990 (NUNES et al. 2014). The fruit of the dragon fruit plant, known as pitaya, has gained significant prominence in the current fruit market, especially in the exotic fruit sector, due to its appearance, red skin covered with scale-like bracts and red or white flesh, and for being rich in bioactive and nutraceutical compounds (LUU et al. 2021, SANTOS et al. 2022). As a fruit crop with high market value (SANTOS et al. 2022), its cultivation has been expanding annually from the North to the South of Brazil.

The dragon fruit plant is recognized for its tolerance to water stress, temperature fluctuations, salinity, low natural soil fertility, and resistance to pests and diseases (CALDAS & VERSLYPE 2016, POLLNOW 2018, LONE et al. 2020, SANTOS et al. 2022).

Various studies are being conducted to elucidate its nutritional requirements (COSTA et al. 2014, ALMEIDA et al. 2016), recommend fertilizer doses (CAVALCANTE et al. 2011, FERNANDES 2016, SANTANA 2019, MOREIRA et al. 2020), and evaluate its tolerance to abiotic stresses such as salinity and water deficit (OROZCO et al. 2017, WANG et al. 2019, QU et al. 2020, SOUSA et al. 2021).

Despite recent advances in nutrition and crop tolerance to water and salt stress, studies on the identification and control of pests occurring in dragon fruit orchards are still scarce. When plant species are introduced to environments different from their origins, native insects, which were not previously recorded as foragers of these plants, will naturally colonize and feed on them. Consequently, these insects may become pests of a particular crop.

One of the main examples is the case of the soybean stem borer beetle *Sternechus subsignatus* (BOHEMAN 1836) (Coleoptera: Curculionidae), which is native to South America and only came into contact with soybean crops when they were introduced in Brazil, becoming a secondary pest in plantations of this species (SILVA 2000). In this context, insects belonging to the orders Coleoptera, Lepidoptera, and Orthoptera are recognized as defoliating insects and are considered potential pests of commercial crops (SILVA 2000).

According to the most recent publications on dragon fruit cultivation, the main insect pests affecting dragon fruit plants are leaf-cutter ants *Acromyrmex* spp., *Atta* spp. (Hymenoptera: Formicidae), stingless bees *Trigona spinipes* (FABRICIUS 1793) (Hymenoptera: Apidae), true bugs, and aphids (LONE et al. 2020, SANTOS et al. 2022).

Given the scenario of expanding pitaya cultivation areas in Brazil, identifying insects potentially harmful to pitaya crops in different Brazilian regions, which may compromise their productivity, is of utmost importance for adopting appropriate control measures.

Moreover, as it is a crop with recent economic exploitation, there are no registered phytosanitary products for pest control. Therefore, alternative products used in organic agriculture are employed for this purpose (NUNES et al. 2014, LONE et al. 2020, OLIVEIRA et al. 2022, SANTOS et al. 2022, SOARES & SANTOS 2022). Thus, understanding the characteristics and habits of these insects is essential for implementing correct and effective management.

Thus, the present study aimed to identify the incidence of harmful insects in a dragon fruit orchard established in the backlands of Pernambuco, Brazil.

The red-skinned and red-fleshed dragon fruit (*H. polyrhizus*) orchard is located at the Serra Talhada Academic Unit of the Federal Rural University of Pernambuco (UAST/UFRPE) (Figure 1A). UAST is situated in the municipality of Serra Talhada, Pernambuco, Brazil. The orchard is located at the geographic coordinates 7° 57' 15" South latitude and 38° 17' 41" West longitude (Figure 1A), with an approximate altitude of 498 m. The local climate is classified according to Köppen as Bwh, described as semi-arid, hot and dry, with average annual temperatures above 25 °C and an average annual rainfall of 650 mm/year. The orchard was established in October 2020 and contains 100 dragon fruit plants (Figure 1B).

From October 2020 to December 2022, on-site photographic documentation and collection of insects damaging dragon fruit plants were conducted. Observations and collections of insects causing harm to cladodes, flowers, and fruits of the dragon fruit were carried out exclusively during daylight hours, from 8:00 AM to 11:00 AM and 2:00 PM to 5:00 PM, using manual capture with tweezers. Specimens were stored in plastic containers for subsequent identification.

The collected insects were stored in a 70% alcohol solution. Subsequently, they were identified to the species level by a taxonomist specializing in the field, through comparison with materials and identification keys on this subject available in the literature (LONE et al. 2020, SANTOS et al. 2022).

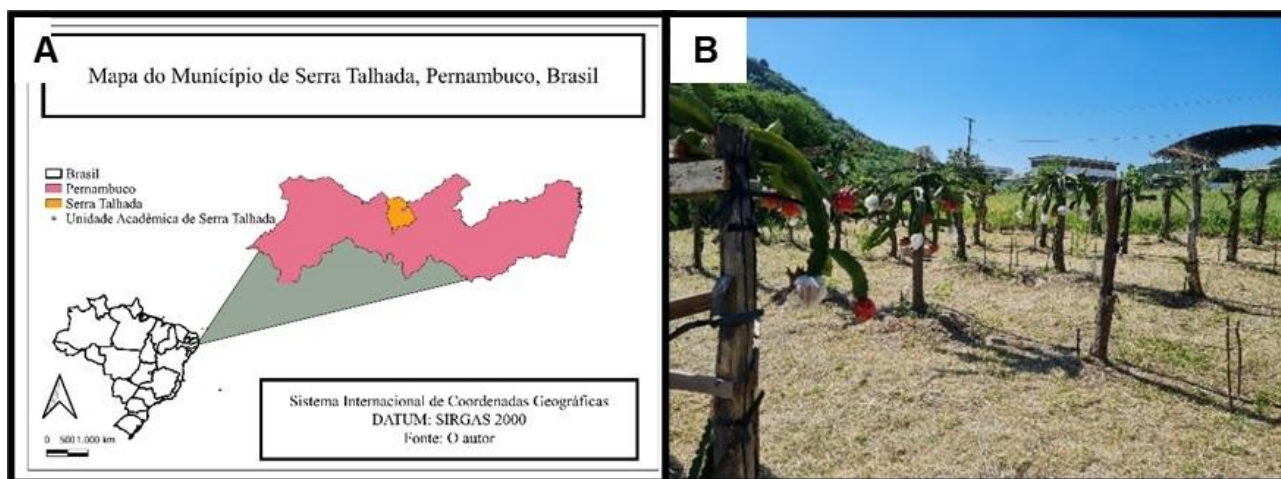


Figure 1. Location of UAST/UFRPE (A) and dragon fruit plants (*Hylocereus polyrhizus*) in the experimental orchard of UAST/UFRPE (B).

Figure 1. Location of UAST/UFRPE (A) and dragon fruit (*Hylocereus polyrhizus*) plants in the UAST/UFRPE experimental orchard (B).

The caterpillars observed in the dragon fruit orchard were collected using tweezers, stored in plastic containers with perforated lids (Figure 2 A), and transported to the laboratory of the Graduate Program in Plant Production at UAST (PPGPV/UAST). The caterpillars were fed daily with pieces of dragon fruit cladodes and kept under ambient conditions until adult emergence (Figure 2 B). From the caterpillars, an adult *A. campestris* was obtained and identified using a classification key for Lepidoptera (COSTA LIMA 1950). The species was confirmed through photographs available in the literature.

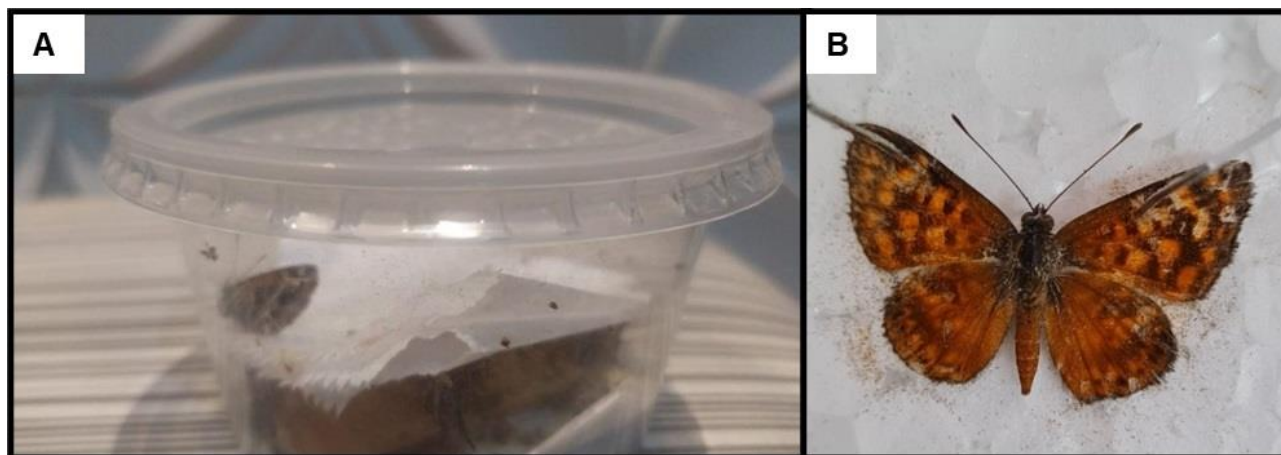


Figure 2. Plastic container used for caterpillar feeding (A) and emergence of the *Aricoris campestris* butterfly from its pupa (B).

Figure 2. Plastic container used to feed the caterpillars (A) and house the *Aricoris campestris* butterfly pupae (B).

In total, during the survey, four insect species present in the dragon fruit orchard established in the Pernambuco backlands (Figures 2 and 3) were recorded causing damage to the dragon fruit plants. These were the stingless bee (*T. spinipes*), the leaf-cutter ant (*A. sexdens*), the caterpillar (*A. campestris*), and the aphid (*M. persicae*) (SOARES & SANTOS 2022).

This is the first record of *A. campestris* caterpillars foraging on dragon fruit cladodes in Brazil (Figure 2, and 3B and 3C). *A. campestris* caterpillars have been observed feeding on cladodes of another cactus, the forage palm (*Nopalea cochenillifera*) in the northeastern region of Brazil (SOUZA et al. 2018). Furthermore, *A. campestris* is one of the most widely distributed butterfly species in the semiarid region (KERPEL et al. 2014). This fact justifies the incidence of *A. campestris* on dragon fruit, given that in the northeastern region of Brazil, there is extensive planting of forage palm intended for livestock feed. Notably, there are cultivation areas of various palm varieties around the UAST dragon fruit experimental field (Figure 1 A). Hypothetically, these cultivation fields were the source of origin for the *A. campestris* caterpillars found in the dragon fruit orchard.

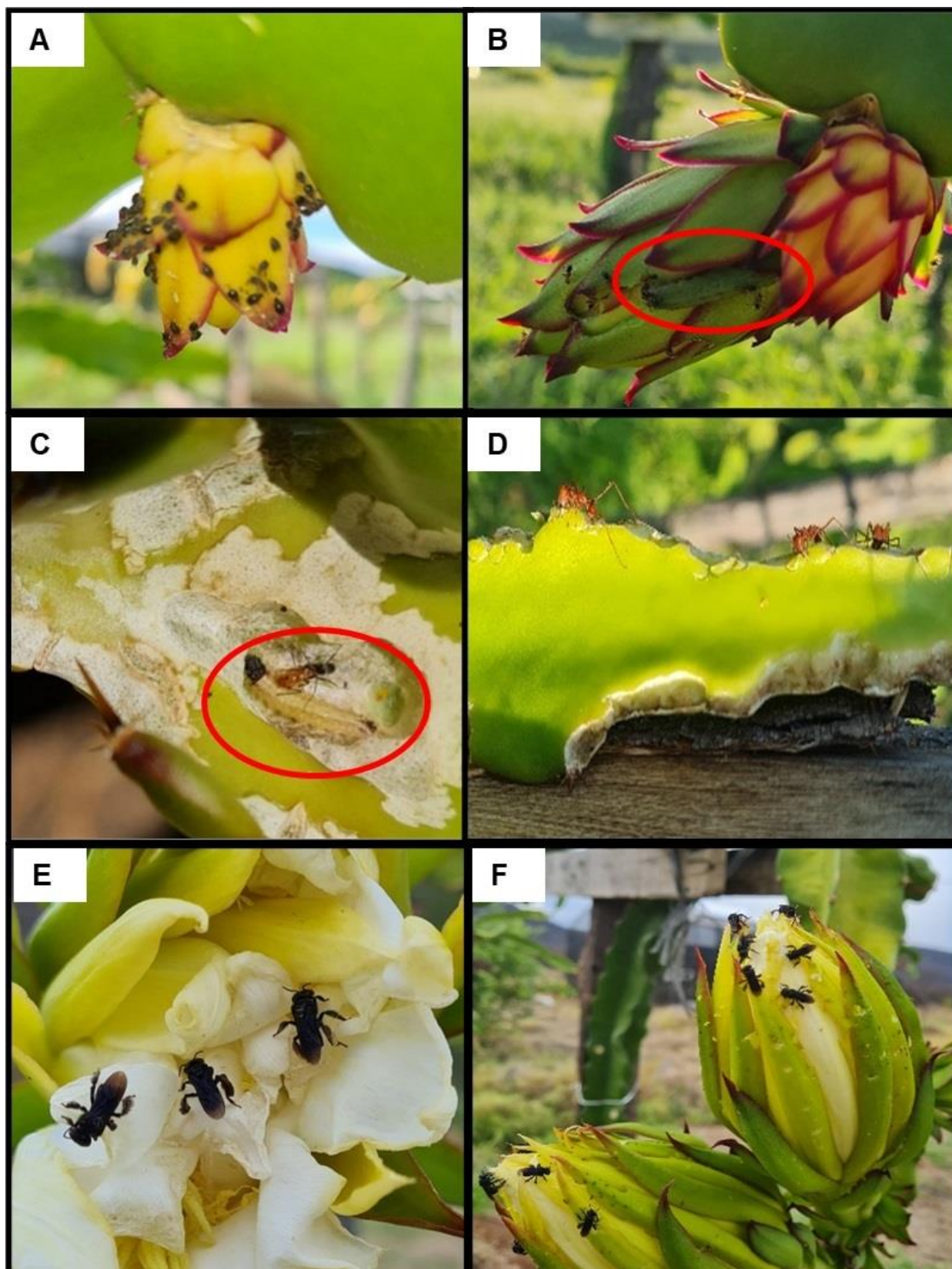


Figure 3. Record of aphid colony on dragon fruit flower bud (A); Presence of caterpillar on flower bud (B) and dragon fruit cladode (C); ant on dragon fruit cladode (D); Attack of stingless bees (*T. spinipes*) on dragon fruit flowers (E and F).

Figure 3. Recording of aphid colonies on dragon fruit flower buds (A); Presence of caterpillar in floral bud (B) and dragon fruit cladode (C); Ant on dragon fruit cladode (D); Arapuá stingless bee (*T. spinipes*) attacking dragon fruit flowers (E and F).

Another important observation is seen in Figure 3D. The caterpillars of the Riodinidae family, to which the *A. campestris* caterpillar belongs, form mutualistic associations with attendant ants, known as

myrmecophily (HALL & HARVEY 2002, KAMINSKI & CARVALHO-FILHO 2012, KERPEL et al. 2014), and this activity is clearly recorded in Figure 3D.

The aphid *M. persicae* is a cosmopolitan pest in Brazilian agriculture. There are reports of aphid attacks on fava beans (AVELINO et al. 2019), potatoes (GOMES et al. 2008), and various other crops. In Figure 3A, it is possible to observe the incidence of aphids on dragon fruit flower buds. It is important to note that, prior to the aphid infestation in the dragon fruit orchard, this same pest was present in a nearby sorghum cultivation, which was likely the source of the infestation that affected the dragon fruit orchard.

The leaf-cutter ant *A. sexdens* was observed on dragon fruit cladodes (Figure 3D). When ants cause damage to cladodes, they facilitate the entry of pathogens that can compromise both the cladode itself and the entire plant (SOARES & SANTOS 2022). According to a study conducted by GIESEL et al. (2021), leaf-cutter ants of the genus *Atta* are phytopolyphagous. In the aforementioned study, the authors observed that 68 plant species distributed across 27 botanical families were used by the ants as forage. Therefore, ant control and monitoring should be a continuous measure in dragon fruit orchards.

Attacks on dragon fruit flowers caused by the stingless bee *T. spinipes* (Arapuá) were observed (Figure 3E and 3F). As they are native and contribute to the pollination of other plant species, eradication measures are prohibited (SOARES & SANTOS 2022). On the other hand, these bees are reported to cause damage to various commercial crops, including cashew trees. Their attack, depending on the crop, can reach damage levels of approximately 50% in flowers and fruits, and the Arapuá primarily attacks flowers and/or fruits (RIBEIRO 2008). As with other pests observed in the dragon fruit orchard, the presence of an alternative host may be the cause of this pest's attack in the dragon fruit orchard. Adjacent to the dragon fruit orchard, there is a cashew orchard where Arapuá bees were previously present.

In Minas Gerais, in the municipality of Couto Magalhães de Minas, ALVES et al. (2018) observed the presence of arapuá bees causing damage to fruits in a dragon fruit orchard. These same authors suggest that the population of this bee should be monitored to prevent productivity losses from reaching economic levels. In Lavras, also in the state of Minas Gerais, MARQUES et al. (2012) observed that the main insects causing damage to fruits, flowers, and cladodes of dragon fruit were ants (*A. sexdens* and *Solenopsis* sp.) and the arapuá bee (*T. spinipes*). Monitoring of these pests is also advised, especially the arapuá, since it is a native insect protected by law.

In general, in the Pernambuco backlands, the incidence of four insect species was observed in dragon fruit cultivation with the potential to cause damage and become pests: caterpillar *Aricoris campestris* (BATES 1868) (Lepidoptera: Riodinidae), leaf-cutter ant *Atta sexdens rubropilosa* (FOREL 1908) (Hymenoptera: Formicidae), stingless bee *Trigona spinipes* (FABRICIUS 1793) (Hymenoptera: Apidae), and green peach aphid *Myzus persicae* (SULZER 1776) (Hemiptera: Aphididae). This is the first record of *A. campestris* caterpillars causing damage to dragon fruit plants. Furthermore, the insects that damaged dragon fruit plants in the Pernambuco backlands generally had alternative hosts near the dragon fruit orchard. This fact should be taken into account when deciding on the location for establishing new plantations in the region.

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