REVISTA CONTRIBUCIONES A LAS CIENCIAS SOCIALES

The vector *Haplaxius crudus* (Hemiptera: Cixiidae) and potential vectors of lethal yellowing occur in palm trees of socioeconomic importance in Amapá, Brazil

O vetor *Haplaxius crudus* (Hemiptera: Cixiidae) e potenciais vetores do amarelecimento letal ocorrem em palmeiras de importância socioeconômica no Amapá, Brasil

El vector *Haplaxius crudus* (Hemiptera: Cixiidae) y los vectores potenciales del amarillamiento letal se encuentran en palmeras de importancia socioeconómica en Amapá, Brasil

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ABSTRACT
Lethal Yellowing (LY) is a disease considered absent quarantine pest in Brazil, highly devastating, currently without efficient control, severely impacting coconut plantations in several countries, in addition to affecting 42 other palm species. The disease is caused by phytoplasmas, which are transmitted by planthoppers via feeding on plant phloem sap. The objective of this study was to identify the occurrence and composition of planthopper communities that are potential vectors of LY phytoplasmas in association with palm trees of socioeconomic importance in Amapá, Brazil. Planthoppers were collected in November 2022 and January 2023 (Less rainy season), April, May and June 2023 (Rainy season), in palm species (lowland açaí palm - LLA, upland açaí palm - ULA, bacaba palm - BC and peach palm - PC). The greatest diversity of families the planthoppers was observed in the cultivation of LLA, with values between 288 mm and <79 mm in the months of May 2023 and November 2022; however, the adults of *Haplaxius crudus*, vector of LY, occur in warmer periods and only in upland palm trees (ULA, BC, PC), with intermediate rainfall conditions, between 211 mm and 79 mm. The composition of the planthopper community was abundant and diverse in the area of native açaí palm trees. The species *H. crudus*, vector of LY, occurs in the cultivation of upland açaí palm, peach palm and bacaba palm in warmer periods. Such information supports containment strategies that avoid catastrophic damage to the economy associated with palm trees in Brazil.

Keywords: '*Candidatus* Phytoplasma Palmae', quarantine pest, sucking insect, preventive measures.

RESUMO
O Amarelecimento Letal (AL) é uma praga quarentenária ausente no Brasil, altamente devastadora, sem controle eficiente atualmente, impactando severamente plantações de coqueiro em vários países, além de afetar outras 42 espécies de palmeiras. A doença é causada por

fitoplasmas, que são transmitidos por cigarrinhas via alimentação no floema vegetal. Objetivou-se identificar a ocorrência e a composição das comunidades de cigarrinhas potencialmente vetoras de fitoplasmas do AL em associação com palmeiras de importância socioeconômica no Amapá. As coletas das cigarrinhas foram realizadas nos meses de novembro de 2022 e janeiro de 2023 (Período menos chuvoso), abril, maio e junho de 2023 (Período chuvoso), em espécies de palmeiras (açaizeiros de várzea - AV, açaizeiros de terra firme - ATF, bacabeira - BC e pupunheira - PP). A identificação das cigarrinhas foi realizada por meio de chaves dicotômicas e comparação de exemplares. O modelo de regressão em árvore foi realizado em função da precipitação pluviométrica (mm) e espécies de palmeiras estudadas. Coletou-se um total de 145 indivíduos pertencentes às famílias de Cicadellidae, Membracidae, Flatidae, Derbidae, Delphacidae, Cixiidae, Nogodinidae, Membracidae e Dictyopharidae. A maior diversidade de famílias foi observada no cultivo de AV, com os valores entre 288 mm e <79 mm nos meses de maio de 2023 e novembro de 2022, no entanto os adultos de *Haplaxius crudus*, vetor do AL, ocorre em períodos mais quentes e apenas em palmeiras de cultivo de terra firme (ATF, BC, PP), com as condições intermediárias de chuva, entre 211 mm e 79 mm. A composição da comunidade de cigarrinhas foi abundante e diversa na área de açaizeiros nativos. A espécie *H. crudus*, vetor de AL, ocorre no cultivo de açaizeiros de terra firme, pupunheiras e bacabaeiras em períodos mais quentes. Tais informações embasam estratégias de contenção que evitem danos catastróficos à economia associada às palmeiras no Brasil.

Palavras-chave: '*Candidatus* Phytoplasma Palmae', praga quarentenária, inseto sugador, medidas preventivas.

RESUMEN

El Amarillamiento Letal (AL) es una plaga cuarentenaria altamente devastadora, ausente en Brasil y actualmente sin control efectivo. Afecta gravemente las plantaciones de coco en varios países, además de afectar a otras 42 especies de palmeras. La enfermedad es causada por fitoplasmas, que son transmitidos por las Auchenorrhyncha al alimentarse del floema de la planta. El objetivo fue identificar la presencia y composición de las comunidades de Auchenorrhyncha, potenciales vectores de fitoplasmas de AL, asociadas con palmeras de importancia socioeconómica en Amapá. Se recolectaron Auchenorrhyncha en noviembre de 2022 y enero de 2023 (temporada baja de lluvias), y en abril, mayo y junio de 2023 (temporada de lluvias), de especies de palmeras (açaí de llanura aluvial - AIA, açaí de tierra firme - ATF, bacabeira - BC y pejibaye - PE). Se identificaron las Auchenorrhyncha mediante claves dicotómicas y comparación de especímenes. Se desarrolló un modelo de regresión arbórea basado en la precipitación (mm) y la especie de palma estudiada. Se recolectaron 145 individuos pertenecientes a las familias Cicadellidae, Membracidae, Flatidae, Derbidae, Delphacidae, Cixiidae, Nogodinidae, Membracidae y Dictyopharidae. La mayor diversidad de familias se observó en el cultivo de AV, con valores entre 288 mm y <79 mm en los meses de mayo de 2023 y noviembre de 2022. Sin embargo, los adultos de *Haplaxius crudus*, vector de AL, se presentan en períodos más cálidos y solo en palmeras de secano (ATF, BC, PE), con condiciones de precipitación intermedias, entre 211 mm y 79 mm. La composición de la comunidad de Auchenorrhyncha era abundante y diversa en la zona nativa de palma de açaí. La especie *H. crudus*, vector de AL, se encuentra en el cultivo de palma de açaí de tierra firme, pejibaye y bacaba durante los períodos más cálidos. Esta información respalda las estrategias de contención que previenen daños catastróficos a la economía palmicultora en Brasil.

Palabras clave: '*Candidatus* Phytoplasma Palmae', plaga cuarentenaria, insecto chupador, medidas preventivas.

1 INTRODUCTION

In Brazil, there are approximately 390 species of palm trees, most of which are present in the Amazon, with 41 genera and 290 species (Oliveira; Rios 2014). Among the palm trees of socioeconomic importance in the national territory, some species stand out, such as coconut (*Cocos nucifera* L.), which places the country in the fourth position in the world ranking of its production (FAO, 2017), and açaí palm (*Euterpe oleracea* Mart.), which has great importance in food and income in the northern region of Brazil, in addition to bacaba palm (*Oenocarpus bacaba* Mart.) and peach palm (*Bactris gasipaes* Kunth) (Silva *et al.,* 2021).

The aforementioned palm trees have high potential for growth in the market, being widely exploited in the state of Amapá for the subsistence of numerous families. However, phytosanitary problems are a major obstacle, since the commercialization of products from these palm trees and other plants can be restricted due to the need to implement strict quarantine measures (Adaime, 2018).

In this context, one of the main phytosanitary obstacles in palm species is Lethal Yellowing (LY), the main and most devastating disease that occurs in coconut palm cultivation worldwide, as there is no efficient control method so far. LY occurs in more than 43 palm species, with records in the Caribbean, Central and North America, East and West Africa, and in the Pacific (Dollet; Talamini 2018). In Brazil, this disease is considered absent quarantine, but with imminent risk of entry into the national territory, being able to cause serious devastation in palm species of socioeconomic and environmental importance.

The phytoplasmas of the 16S rDNA (A-F) group are the cause of LY-type diseases, and these microorganisms are transmitted by sucking insects that feed on the sap of the phloem tissues of palm trees and tend to spread the pest to healthy palm trees. Currently, some families of planthoppers, such as Cixiidae, Derbidae, Delphacidae, Nogodinidae and Flatidae, of the Fulgoromorpha group, and the subfamily Deltocephalinae (Cicadomorpha Group/Cicadellidae Family), are potentially vectors of LY, as they have the habit of feeding on phloem sap (Weintraub; Beanland 2006).

To date, only the species *Haplaxius crudus* (Van Duzee, 1907), belonging to the Cixiidae family, has been proven and confirmed as a vector of LY phytoplasmas, through transmission tests in coconut trees in Florida, United States (Gurr *et al.,* 2016; Dollet; Talamini 2018). Thus, it is necessary to know the diversity of these potentially vector insects, since the disease exists on the African continent, but there is no presence of *H. crudus*, which highlights the existence of other vector species of the phytopathogen in these locations.

Currently, there are pioneering studies in Brazil on planthoppers potentially vectors of phytoplasmas in coconut trees, conducted in the states of Pará, Sergipe, Alagoas, and Bahia (Silva *et al.,* 2018; Bartlett *et al.,* 2018; Bastos *et al.,* 2019; Silva *et al.,* 2019a, b; Dollet *et al.,* 2020). However, there are no studies on the distribution of planthopper species potentially vectors of phytoplasmas in other native palm species in Brazil, such as açaí palm, bacaba palm and peach palm, and particularly in the state of Amapá, which borders French Guiana and has been a route of entry and dissemination of agricultural pests.

In view of the above, it is necessary to carry out research that informs about the occurrence, diversity and composition of planthopper communities potentially vectors of the LY phytopathogen that live in association with local palm trees, in addition to the influence of the environmental conditions found in the locality. Therefore, the present study is of crucial importance for generating information that is made available to the scientific community in general and, especially, to the phytosanitary defense agencies of Brazil. Such information is indispensable to advance the knowledge about the distribution of planthopper species with potential for phytoplasma dissemination, supporting containment strategies that avoid catastrophic damage to the economy associated with palm trees, especially açaí palm, due to its wide use in the northern region of Brazil.

2 MATERIAL AND METHODS

2.1 CHARACTERIZATION OF THE STUDY AREA

The study was carried out in the Mazagão Experimental Field, belonging to Embrapa Amapá (Brazilian Agricultural Research Corporation), in upland areas with açaí palm (BRS Pará), bacaba palm (native) and peach palm (BRS Peru) (0°7’19.395” S; 51°17’56.448” W), and

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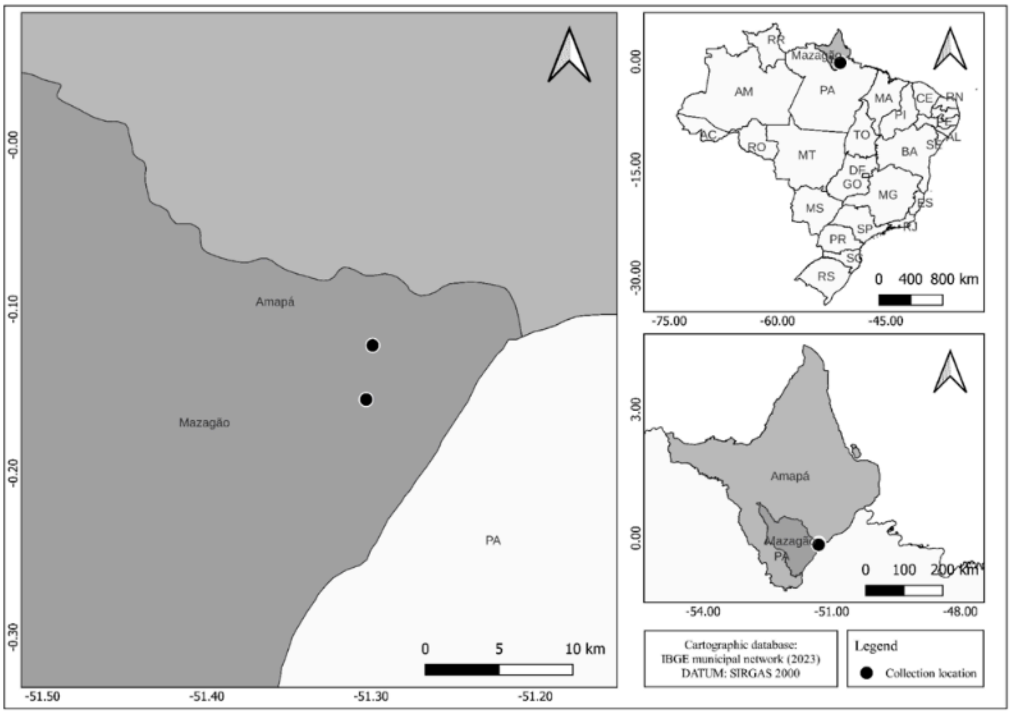
also in the Barreiro Settlement (0º9’18.1512” S; 51º18’10.5654” W), in a lowland area of native açaí palm, both areas located in the municipality of Mazagão, Amapá (Figure 1).

Figure 1. Locations of collection of planthoppers potentially vectors of LY phytoplasmas in the municipality of Mazagão, Amapá State, Brazil.



Source: Prepared by the authors.

The climate of the region is hot tropical, with average temperatures of 26 to 28 °C and rainfall between 2,500 mm and 3,500 mm (EEZ, 2008). During the study, the data on temperatures and rainfall were obtained from the database of the Center for Hydrometeorology and Renewable Energies (NHMET) of the Amapá State Institute of Scientific and Technological Research (IEPA), being fundamental for explaining the distribution and abundance of the planthopper species in the palm trees that were studied as primary host plants.

The upland açaí palm trees (BRS Pará) cultivated in a 0.6-ha area were 12 years old, arranged in a spacing of 5 x 4 m, and the plants in which the traps were installed had an average height of 6.2 m. In the lowland area, the açaí palm trees did not have standardized spacing, as well as plant height, so plants with average height similar to that of upland açaí palm trees were used in this study.

Peach palm trees of the BRS Peru variety were arranged at a spacing of 5 x 4 m, with an average height of 2 m. Bacaba palm trees grown from native seeds were arranged at a spacing of 7 x 7 m and had an average height of 10.77 m.

2.2 TRAP INSTALLATION AND PLANTHOPPER COLLECTION

Planthoppers were collected monthly, in November 2022 and January 2023 (Less rainy period) and in May and June 2023 (Rainy season), in a total of 4 collections. Ten plants of each palm species from each area were randomly selected to install capture traps, and a yellow adhesive trap (Isca®, double-sided, with dimensions of 8.5 × 11 cm) was installed on each selected plant, with the help of a *peconha* (fiber-made, climbing artifact used by açaí and bacaba collectors attached to their feet) when necessary.

For taller plants, an adaptation was made, placing a nylon thread on the palm leaf and leaving it attached near the collar. In this way, in each month of collection, the trap was placed on the nylon thread, which was pulled to the leaf of each palm tree to install the trap, without the need to climb it.

The traps were placed in central leaflets of the lowest active leaves and kept on the plants for a period of 10 days; soon after, they were collected for screening. Planthoppers were removed using a solvent (Allchem® Tira Cola), according to the methodology adapted from Silva *et al.* (2018). The planthoppers removed from the traps were placed in a 15-mL Falcon® tube containing 70% alcohol, for later taxonomic identification.

2.3 DATA ANALYSIS

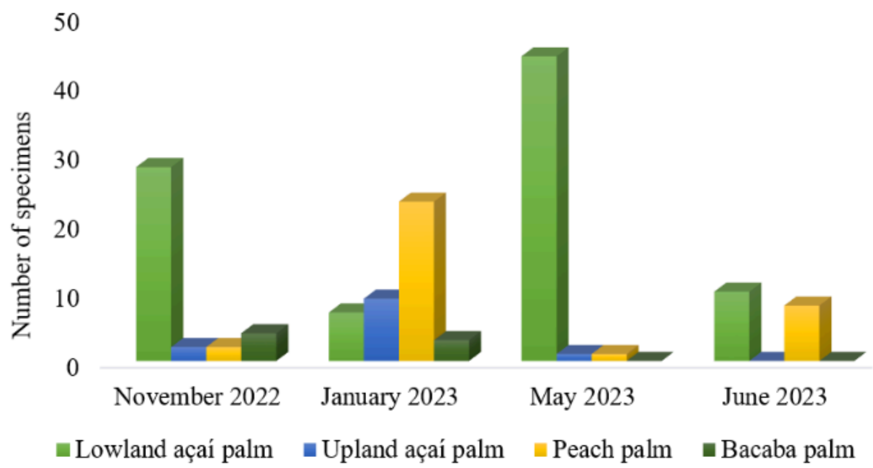
Planthoppers were identified at the family level, based on characterizations and dichotomous keys (Triplehorn; Johnson 2011). Subsequently, the vector species, *H. crudus*, was identified by comparing it with specimens already identified and collected in the municipality of Santa Isabel do Pará, Pará state, Brazil (Silva *et al.,* 2018).

Tree regression analysis was performed using the Rpart and rpart.plot packages with R statistical software (Themeau *et al.,* 2019; Santos, 2020), as a function of rainfall (mm) and the palm species in the studied areas, which may have influenced the emergence of the planthopper families. The root node in the regression tree indicated the total number of samplings, being divided into two or more sets, called decision nodes, and into sub-nodes and/or terminal nodes.

3 RESULTS

A total of 145 specimens of planthoppers potentially vectors of phytoplasmas were collected in the areas with açaí palm (lowland and upland), peach palm and bacaba palm trees during the study period. The highest abundance of planthoppers (44 specimens) was collected from lowland açaí palm trees in May 2023 (275.8 mm; 26.5 ºC) and November 2022 (12.2 mm; 28.95 ºC), with 28 specimens, followed by the area with peach palm (23 individuals) in January 2023 (146.4 mm; 26.4ºC), while in the other areas a less abundant composition of planthopper communities was observed, especially in the months of May and June in upland açaí palm trees and bacaba palm trees (Figure 2).

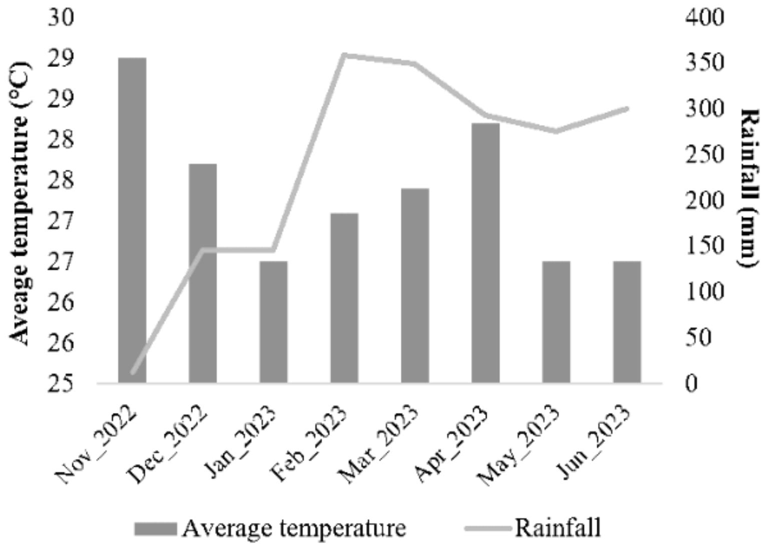
Figure 2 Number of specimens of planthoppers potentially vectors of phytoplasmas captured in the study periods in lowland and upland açaí palm trees, peach palm trees and bacaba palm trees, in the municipality of Mazagão, AP, Brazil.



Source: Prepared by the authors.

During the collection period, a variation was observed in the average temperature in the study areas, ranging from 26.5 °C (January, May and June) to 29 °C (November), while the rainfall levels ranged from 12.2 mm (November) to 359.1 mm (February). It is worth noting that the largest number of specimens of planthoppers were captured in May, November and January, which showed a low to intermediate volume of rainfall, compared to the other months (Figure 3).

Figure 3 Average temperature (°C) and rainfall (mm) during the collection period of planthoppers potentially vectors of LY phytoplasmas in palm trees in the municipality of Mazagão, AP, Brazil.



Source: Prepared by the authors.

In the lowland açaí palm trees, 87 specimens were collected, belonging to seven families: Cicadellidae (65), Membracidae (14), Flatidae (3), Derbidae (2), Delphacidae (1), Cixiidae (1) and Nogodinidae (1). Of this total, 35 specimens were captured in November 2022 and January 2023, and 52 specimens were captured in May and June 2023 (Figure 4 A). It was noticed that, in this area, in May, when the rainfall was 275.8 mm and the average temperature was 26.5 ºC, there was a greater abundance of specimens associated with the lowland açaí palm trees, but a lower diversity of families, limited to the occurrence of specimens of the families Cicadellidae (35), Membracidae (4) and Derbidae (1).

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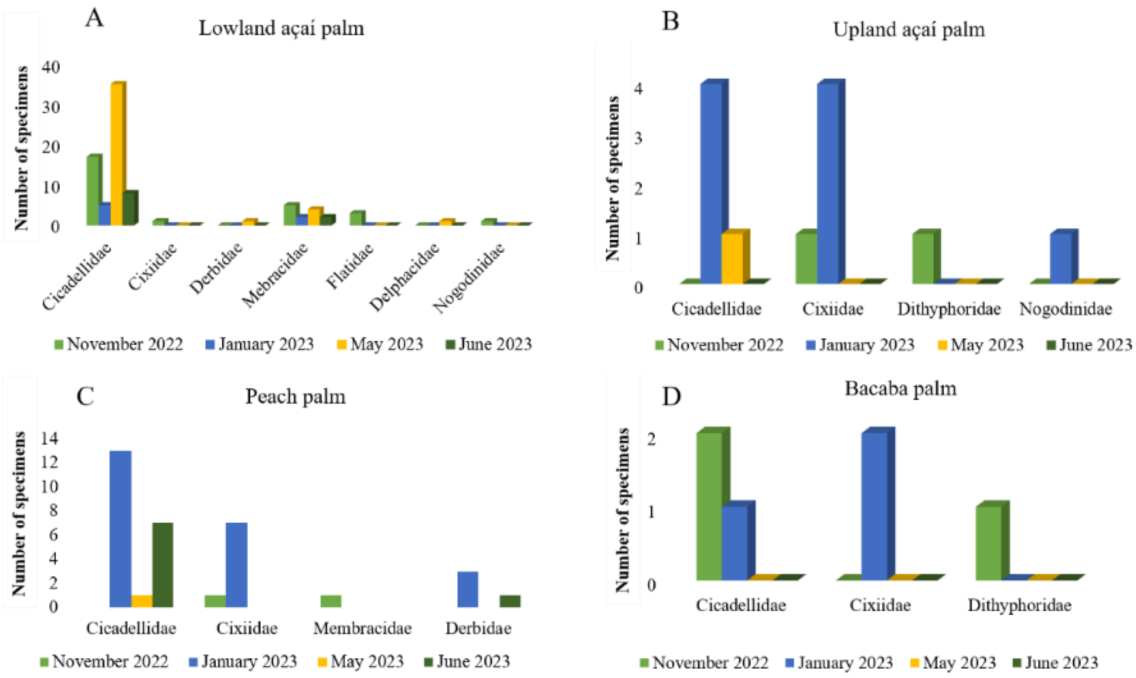
Figure 4 Families of planthoppers potentially vectors of phytoplasmas occurring in the areas of lowland açaí palm trees (A), upland açaí palm trees (B), peach palm trees (C) and bacaba palm trees (D) during the study period, in the municipality of Mazagão, AP, Brazil.



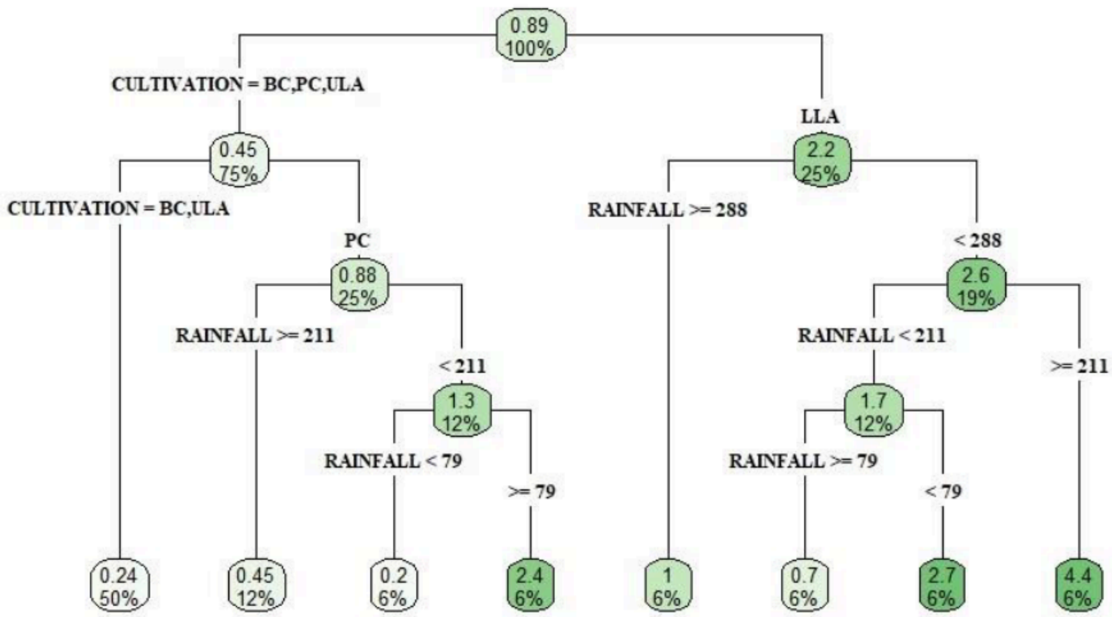
Source: Prepared by the authors.

In the upland açaí palm trees, 10 specimens were collected, corresponding to four families: Cicadellidae (5), Cixiidae (3), Dictyopharidae (1) and Nogodinidae (1), with 9 specimens captured in November 2022 and January 2023 and 1 individual captured in May and June 2023 (275.8 mm; 26.5 ºC). Of the 3 specimens of the Cixiidae family, 2 were of the species *H. crudus*, one male and one female (Figure 4B).

In the cultivation of peach palm, 32 specimens of the following families were identified: Cicadellidae (21), Cixiidae (4), Derbidae (4) and Membracidae (1). Of this total, 25 specimens were collected in November 2022 and January 2023, and 9 specimens were collected in May and June 2023 (Fig 4C). Among the 4 specimens of the Cixiidae family, three were females of *H. crudus*. In the cultivation of bacaba palm, there was a lower diversity and abundance of planthoppers, with only 6 specimens from 3 families (Cicadellidae (3), Cixiidae (2) and Dictyopharidae (1)), captured only in November 2022 and January 2023. The two specimens found in the Cixiidae family were *H. crudus*, a proven vector of phytoplasmas that cause LY (Figure 4D).

Rainfall and the areas with native and cultivated palm trees (lowland açaí palm - LLA and upland açaí palm - ULA; peach palm - PC and bacaba palm - BC) explain the composition of the planthopper communities (Figure 5). The tree has a root node, divided into two groups, which indicates that 75% of the specimens of planthoppers make up the communities associated with the cultivation of upland açaí palm, bacaba palm and peach palm, being different from the 25% of the specimens that formed the other group, indicating the emergence of another community of planthoppers captured in an area of native lowland açaí palm trees.

Figure 5 Tree regression model of the planthopper community as a function of rainfall and areas with palm trees in the municipality of Mazagão, Amapá, Brazil.



Source: Prepared by the authors.

Within the group with the cultivation of palm trees (ULA, BC and PC), there was a subdivision based on the amount of rainfall in the study period, indicating that 38% of the composition of the planthopper community emerged with conditions of rainfall >= 211 mm and <= 211 mm. Under conditions of rainfall >= 211 mm, 25% of the specimens were part of the composition of the planthopper communities of the ULA and BC cultivation areas, indicating similarity between them, while 12% of the specimens formed the composition of another community with the cultivation of PC.

When the rainfall volume was <=211 mm, two subdivisions emerged from the rainfall volume of < 79 mm and >= 79 mm, indicating that 19% of the specimens appeared in the areas with the condition of <79 mm and the remaining 19% appeared with a rainfall volume >=79 mm, which enabled the occurrence of 12% of specimens in the composition of similar communities in the areas with ULA and PC, while 6% of specimens indicated the formation of another planthopper community in the BC area, under these rainy conditions (Figure 5).

In the grouping with the isolated LLA area, rainfall >= 79 mm and < 79 mm indicated that 25% of the specimens of the planthopper community occurred under these conditions, of which 19% appeared with the presence of the rain volume < 211 mm and >= 211 mm, and only 6% of the specimens of these communities preferred the condition of < 79 mm of rain. When the rainfall in this area was >= 211 mm, 6% of the specimens appeared under conditions of rainfall < 288 mm and another 6% appeared with the presence of rainfall >= 288 mm (Fig 5).

In view of these results, it was observed that the intermediate rainfall conditions, between 211 mm and < 79 mm, in the areas of ULA, BC and PC, contribute to the emergence of the different families that make up the communities of planthoppers potentially vectors of phytoplasmas that cause LY, while in the LLA area, the values between 288 mm and < 79 mm explained the formation of the community, which was different from the other upland areas studied.

4 DISCUSSION

Information on the composition of planthopper communities associated with areas with palm trees of socioeconomic importance for the North Region has not yet been published, and the occurrence of the LY vector, *H. crudus*, in the areas of upland açaí palm, peach palm and bacaba palm, as well as species of planthoppers potentially vectors of phytoplasmas in these palm trees and in the lowland açaí palm trees in the municipality of Mazagão, Amapá, Brazil, has been confirmed in the present study.

Although it is the first record of the occurrence of *H. crudus* in the state of Amapá, studies have already been carried out in the North region, in the state of Pará, where this species was found in commercial coconut plantations (Silva *et al.,* 2019). Another study that corroborates such information was conducted by Bastos (2019), who studied the spatial-temporal dynamics of *H. crudus*, associated with commercial coconut plantations in the state of Pará. In the Northeast region, in the state of Sergipe, although the LY vector was not found, the unprecedented presence of another species belonging to the Cixiidae family, *Oecleus sergipensis*

(Hemiptera: Auchenorrhyncha: Cixiidae), which enters the list of potentially vector species that feed on plant phloem, was identified by Silva (2018).

In the present study, although *H. crudus* was not found in the lowland açaí palm trees, there was a significant diversity of planthopper families, a factor that may be related to the type of vegetation found close to the naturally occurring açaí palm trees, as well as the reduced human interference, which contributes to a diversity of species of host groundcover plants, in addition to making the environment more conducive to the feeding and development of the reproductive cycle of insects. However, flooding in the lowland area does not favor the reproduction of Cixiidae in this period, since this family uses the groundcover vegetation to lay their eggs and, consequently, for the development of the young phase of the species. Thus, excess water in the soil possibly disfavor the occurrence of *H. crudus* in this environment.

However, rainfall and temperature conditions are factors that significantly and directly interfere in the abundance and richness of planthopper communities. The Cixiidae family, for example, prefers drier environments with high temperatures, and the population of *H. crudus* decreases as the amount of rainfall increases and the temperature decreases (Bastos *et al.,* 2019).

A study carried out by Tsai and Kirsch (1978) corroborates the aforementioned authors, since they examined the development of *H. crudus* at 15 ºC, 24 ºC and 30 ºC in *Stenotaphrum secundatum* grass and observed that the nymphs did not reach the adult stage when subjected to a temperature of 15 ºC. At 24 ºC, the oviposition time and the adult phase were longer, reaching an average of 80.8 days and with nymphs living from 7 to 8 days in the adult phase. On the other hand, the temperature of 30 ºC proved to be ideal, as complete development lasted less time, 52.6 days, and adults lived an average of 37 to 50 days, thus spending less time subjected to environmental factors.

Other families of planthoppers are typical of the dry season (Silva, 2018), as observed in this study, in which the Cicadellidae family was captured in months when rainfall levels fluctuated, especially in November, when rainfall is scarce, and in January, which is considered the transition from the least rainy to the rainy period in the North region. It is worth pointing out that several subfamilies of Cicadellidae feed on the plant phloem, being part of the potential vectors for LY (Passos *et al.,* 2022). Thus, it is evident that this family has individuals that live in different months of the year and under different environmental conditions, especially in relation to rainfall and temperature, so it is important to know the population behavior of these potential vectors in order to contribute to preventive control measures against insects that can transmit LY phytoplasmas.

The Derbidae family, on the other hand, prefers a wetter habitat (Bastos, 2019), which has been observed in the Northeast Region of Brazil, in coconut plantations, where the peak of the species of this family appeared in the months with the highest volume of rainfall (Bierhals, 2021; Silva *et al.,* 2018). In the present study, the individuals of this family were captured in greater quantity in January, when there was an intermediate rainfall volume in Amapá, similar to the rainy conditions of the Northeast Region.

Both rainfall and the areas with different species of palm trees directly influenced the composition of the communities of adult planthoppers, since species of the families Cicadellidae, Membracidae and Derbidae occur in greater abundance in periods with a greater volume of rainfall, compared to the families Cixiidae, Dictyopharidae and Nogodinidae, which prefer less rainy periods. This indicates the variation in the population behavior of planthopper species, so it is of paramount importance to conduct studies on population dynamics, especially of families that are potential vectors of LY phytoplasmas.

In addition to abiotic conditions, some biotic factors are also important to understand the abundance and richness of these insects. A factor that may have influenced the composition of the planthopper community in the area of bacaba palm trees was plant height, since these trees had an average height of 10.77 m, being much taller than the other palm trees evaluated during the study period. However, even with this condition, planthoppers, including individuals of *H. crudus*, were captured in this species of palm tree. Nonetheless, it is necessary to carry out research on this possible evidence, analyzing whether plant height can interfere with the abundance of the vector species associated with this palm tree.

It is worth pointing out that the vegetation factor also influenced the occurrence of potentially vector planthoppers and *H. crudus* in the areas with upland cultivation, since in the area with peach palm trees it was possible to observe the predominance of groundcover plants between the cultivation rows, while in the areas with bacaba palm and upland açaí palm, the groundcover vegetation between the cultivation rows was less predominant, influencing the diversity and abundance of species in the planthopper communities.

In addition, some mowing operations were carried out during the study period in the areas with upland palm trees, interfering in the growth of vegetation in this environment and consequently in the reproductive cycle of planthoppers of the Cixiidae family, which may have been a factor for the capture of a reduced number of *H. crudus* and species of other families of planthoppers potentially vectors of LY.

Groundcover vegetation in areas with palm trees is a determining factor, especially when it comes to host species of planthoppers. Hernandes *et al.* (2018) observed that *Brachiaria humidicola* is one of the main host plant species used by *H. crudus* for reproduction. This information is of great relevance because, once the plants that serve as hosts for these insects are known, it is possible to study and develop possible methods that serve as control for planthopper vectors.

5 CONCLUSION

Therefore, the composition of the planthopper community was abundant and diverse in the area of native açaí palm trees. The planthoppers potentially vectors recorded and associated with palm trees of socioeconomic importance belong to the families Cixiidae, Cicadellidae, Derbidae, Delphacidae, Flatidae, Nogodinidae and Dictyopharidae.

The species *H. crudus*, a proven vector of LY, occurs in the cultivation of upland açaí palm, peach palm and bacaba palm, in the municipality of Mazagão, Amapá, Brazil. Rainfall and temperature are determining factors in the composition of the community of planthoppers potentially vectors of phytoplasmas, indicating the occurrence of *H. crudus* adults in warmer periods.

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