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SURVEY AND REGISTRATION OF THE OCCURRENCE OF LEAF-CUTTING ANTS IN GRASSLAND AREAS

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ABSTRACT - Leafcutter ants tend to adapt to the different climatic conditions, soil, and vegetation.They also have the particularity of attacking different cultures. The objective of this work was to survey and record the occurrence of leafcutter ants in 5 pasture areas located in the municipalities of Altônia, Iporã, and Cafezal do Sul, as well as to identify them at the genus level. The study areas were covered by the walking method, performing the geolocation of the anthills in order to verify the incidence of anthills, calculating the anthill areas, preparing maps of land use, and occupation and geolocation of the anthills, calculating the density and the spatial distribution of anthills. Across the 5 areas, 56.72 ha of pasture were sampled and the existence of anthills inside the properties was established. Totally, 55 anthills were sampled from which specimens were collected for identification at the genus level, which will be classifiedunder the genus Atta. The areas of the anthills vary from 0.26 m² to 97.34 m². The density of anthills ranged between 0.25 and 0.75 anthills ha-1and the spatial distribution obtained was I = 1.13. Of the 55 anthills, all belonging to the Atta genera, and different types of management related to the occurrence of leafcutter ants in the areas.On the basis of the evaluation of monitoring and georeferencing data, it was possible to record the occurrence of leafcutter ants in pasture areas in the cities of Altônia, Cafezal do Sul, and Iporã, which presented different distribution and density of nests. In all evaluation areas, the domain of the genus Atta was registered.
Keywords: *Atta*, pests, anthills, grass, sausages.

LEVANTAMENTO E REGISTRO DE OCORRÊNCIA DE FORMIGAS CORTADEIRAS EM ÁREAS DE PASTAGENS

RESUMO - As formigas cortadeiras tendem a se adaptar a diferentes condições climáticas, solo e vegetação, e apresentam particularidade de atacar diversas culturas. O objetivo deste trabalho foi realizar o levantamento e registro de ocorrência de formigas cortadeiras em 5 áreas de pastagem situadas nos municípios de Altônia, Iporã e Cafezal do Sul, bem como identificá-las, a nível de gênero. As áreas de estudo foram percorridas pelo método de caminhamento, realizando a geolocalização dos formigueiros a fim de constatar a incidência de formigas, calcular as áreas dos formigueiros, elaborar mapas de uso e ocupação do solo ede geolocalização dos formigueiros, calcular a densidade e a distribuição espacial dosformigueiros. Percorrendo as 5 áreas, foram amostrados 56,72 ha de pastagem e comprovada a existência de formigueiros no interior das propriedades, foram amostrados 55 formigueiros, dos quais foram coletados os espécimes para identificação em nível de gênero, que permitiu concluir a ocorrência gênero *Atta*. As áreas dos formigueiros variaram entre 0,26 m² a 97,34 m². A densidade dos formigueiros variou entre 0,25 e 0,75 formigueiros ha^{-1} e a distribuição espacial obtida foi $I^{\delta} = 1{,}13$. Dos 55 formigueiros todos pertencem aos gêneros Atta, e diferentes tipos de manejos estão relacionados ocorrência de formigas cortadeiras nas áreas. A partir da avaliação de dados de monitoramento e georreferenciamento foi possível registrar a ocorrência de formigas cortadeiras em áreas de pastagem nos municípios de Altônia, Cafezal do Sul e Iporã, as quais apresentaram distribuição e densidade de ninhos diferentes. Em todas as áreas avaliadas foi registrado predomínio do gênero *Atta*.
Palavras-chave: *Atta*, pragas, formigueiros, capim, saúvas.

INTRODUCTION

The current area which is occupied by pastures in Brazil represents 154 million hectares of territory, however, the state of degradation in which these areas are located has generated losses of around R$ 9.5 billion annually for producers (LEONE, 2020). The main factors related to pasture degradation are the low adoption of soil conservation practices, lack of correction of acidity or fertilization, inadequate soil management, and the occurrence of leafcutter ants (REDE BRASIL ATUAL, 2021). According to studies carried out by Antunes et al. (2016), the damage resulting from the attack of leafcutter ants causes production losses in several crops, such as pastures, vegetables, and fruit trees, in addition to causing the devaluation of the infested property.

Leafcutter ants can cause severe damage to pastures because they cut the aerial part of the forage, reducing the availability of forage for the grazing animals, and because they build underground tunnels which, due to the trampling of animals, can cause a rupture in the surface

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layer of the soil and, consequently, destabilization of the animals during grazing with the risk of falls and injury (IDR, 2021).

However, since they adapt to different climates, soils, and vegetation conditions (MENEGHETTI et al., 2015), leafcutter ants are considered one of the main pests of Brazilian agriculture. In exploring the environment in search of suitable materials, leafcutter ants are faced with an infinite variety of plant possibilities, and although they are choosy during the selection process, these insects are considered polyphagous, as they take advantage of numerous plant species during the course of their activity of foraging (FARJI-BRENER et al., 2018).

The control of the colonies is fundamental, since during September and October the flock phenomenon occurs, which results in widespread range and infestations in areas with an extension of up to 10 km. In this phenomenon, females and males leave the anthills for mating and after being fertilized, the females form new anthills (TALLARICO, 2018). Among the forms of control of these insects, we can highlight mechanical control, which consists of the extirpation of anthills in a certain area, with the aid of hoes and mattocks (OLIVEIRA et al., 2011); physical control through the use of physical barriers to protect the aerial parts of the plant, mainly the seedlings (OLIVEIRA et al., 2011). Studies prove that the use of physical barriers with cones made with acetate sheet is capable of preventing access to the ants' food source (ALMEIDA et al., 2013); chemical control (OLIVEIRA et al., 2011; REIS FILHO et al., 2015) and biological control, using biological baits or repellent plants (BUTELER et al., 2019; NASCIMENTO et al., 2018).

In Brazil, 35 genera of leafcutter ants have already been described, with emphasis on *Atta* and *Acromyrmex*, popularly known as saúvas and quenquéns, respectively. The differentiation between these two genera can be made based on anthill architecture, head morphology, and foraging habit, these being the most relevant criteria (BORGHI et al., 2018). Also, according to the authors, the sauva ants are more robust and build large anthills with loose soil. On the other hand, the quequens are smaller when compared to the ants and form small isolated anthills, with no apparent mound of earth.

The genus *Atta* is the one with the greatest economic importance in South America for attacking several economically important crops. In addition, this group of insects is important in another way from an ecological point of view, as it contributes to soil nutrition from the accumulation of organic matter resulting from the carrying of leaves downwards from the soil surface, which allows the propagation of a large number of bacteria, fungi, and nematodes, which play important ecological roles for the sustainability of agroecosystems (CHEEKE et al., 2012). For this reason, leafcutter ants are considered ecosystem engineers, significantly altering the community of microorganisms around the nest (RODRIGUES et al., 2013).

All known Attine ants (more than 250 species described in 16 genera) cultivate basidiomycete fungi as their primary food source (SOSA-CALVO et al., 2013). An example is the fungus *Leuco agaricus gongylophorus*, belonging to the Basidiomycete group, cultivated by leafcutter ants from fresh leaves taken to the nest (GARRETT et al., 2016). After cutting the plant tissue, planters chew the fragments, wetting them with saliva and eventually with a drop of fecal fluid. The prepared substrate is incorporated into the fungus and enriched with mycelia from other parts of the fungus (HÖLLDOBLER; WILSON, 1990).

Normally the ants and quequens cut the leaves during the day and night, however, it is more common during the winter that this cutting occurs only during the day. The caste responsible for this foraging activity is the worker ants, where each one takes full care of its own task, moving to the cutting site, executing it and transporting the leaf fragment into the anthill (GRÜTZMACHER et al., 2002).

The ants use a wide foraging area, cutting across a wide range of plant species. The trails can reach up to 400 m in length and 20 cm in width when cutting the plants (CHERRETT, 1968; LIMA et al., 2001). According to Viana-Beailez and Endringer (2016), the greater the distance that the ant travels, from the nest to the food source, the longer it will take to choose the food and, consequently, the more selective its choice will be. Leafcutter ants can even specialize in cutting, for example, only grasses or dicotyledons, including being more selective, cutting a certain part of the plant, such as flowers and even fruits (GIESEL et al., 2021).

In a study carried out by Andrade et al. (2020), leafcutter ants of the *Acromyrmex balzanis* species were able to differentiate among the quality of the leaves selected for foraging, associating the selection of material quality with the needs of its symbiotic fungus. According to the same authors, these reactions are, in fact, rejection reactions learned by foragers and mediated by the symbiont fungus, since some plants are known to contain deleterious substances to the symbiont fungus, and this is the main factor leading to acceptance or rejection of foraging activity performed by leafcutter ants (SOUSA et al., 2019). These substances can even be highly toxic to leafcutter ants and even to their symbiotic fungus, which can lead to total anthill mortality (ARAÚJO et al., 2018). Geisel et al. (2021) concluded from their studies that plants from the families Poaceae and Asteraceae are the most used in foraging by ants A. *sexdens piriventris*, with the species *Baccharis trimera* (Asteraceae) being the most foraged in the Microregion of Campos de Altitude de Lages.

The activity of exploring plant species for foraging by leafcutter ants involves several steps, many of which are still unknown to human beings (FERREIRA, 2020). According to Della Lucia et al. (2011) there is a need to expand studies related to the behavioral aspects of leafcutter ants in different regions, as they generate information that can help in the management of these insects in the various existing agroecosystems, due to the particularities of each region.

Despite the relevance of this topic in the agriculture scenario, research is still scarce and few areas are monitored and georeferenced in order to establish the survey of anthills in agricultural areas, as well as a management plan in areas with a potential risk of infestation, or which have been already infested. Therefore, the objective of this work was to survey and record the occurrence of leafcutter ants in pasture areas of properties located in the municipalities of Altônia, Iporã, and Cafezal do Sul (PR), as well as to identify them at the genus level.

MATERIAL AND METHODS

The work was carried out between May and July in the municipalities of Iporã, Altônia, and Cafezal do Sul, located in the northwest region of the State of Paraná, with a climate, according to the Köppen classification (PEEL et al., 2007), of the subtropical type. mesothermal humid (*Cfa*), with hot summer months and rare frosts in winter. After authorization from the owners to access the areas, the methodology proposed by Santos et al. (2017), with the delimitation of the study areas using the software Google Earth Pro Version 7.3.1.4507 (64-bit). Then, the areas were covered, performing the geolocation of the anthills found and demarcating them using the Navcon® receiver, model SF 3040–RTK (GNSS technology), configured for the Datum Sirgas 2000 Fuso 22S (Figure 1).

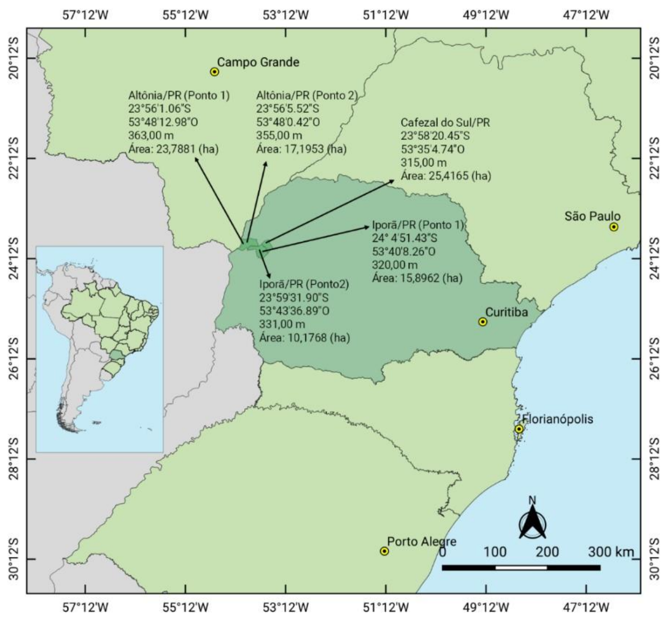

FIGURE 1 - Geolocation of the study areas with emphasis on the municipalities of Iporã, Cafezal do Sul, and Altônia, Paraná.

The use of this technology is necessary and important, as it aims to store the coordinates obtained, thus allowing constant monitoring of quantified anthills, anthill activity, and size increase, distance from the trail traveled to collect the material from the scouts, among others. The equipment makes it possible to register the coordinates of new anthills and establish a history of the evolution of the increase or maintenance of these on the property. In addition, the use of the device makes it possible to accurately calculate the area of the anthills observed, even if they are irregular.

The study sites were selected and consisted of five areas, ranging from 10 to 30 ha, whose descriptions and history are highlighted below. Area 1 had a total area of 23.78 ha and was located in the district of Ouro Verde, on the side of Highway PR-490, in the municipality of Altônia/PR. According to reports, the property began its activities in the mid-1960s, with the implementation of coffee cultivation, which lasted until the 1970s, with the occurrence of the black frost, which decimated a large part of the coffee plantations in the region. The area has a sandy loam textural class (SANTOS et al., 2018) and currently employs the integrated crop-livestock system, with pasture planted with Marandu grass (*Brachiaria brizantha*), on which 35 Nellore steers are kept for the slaughter and 21 dairy cows (breeding-breeding). In addition, part of the area (9.86 ha) is occupied, temporarily, with cassava (*Manihote sculenta*) planting.

Area 2 has 17.19 ha and is also located in the district of Ouro Verde, in the municipality of Altonia. Currently, an area of 3.27 ha is planted with eucalyptus and 11.07 ha with Marandu grass, renovated in early September 2020 and used for the breeding, rearing, and fattening system (33 cows for breeding, 1 breeding bull, 24 steers). Area 3 is located on Estrada Velha, in the Guaiporã district, in Cafezal do Sul/PR, and has soil with a sandy loam textural class (SANTOS et al., 2018). The area has 25.41 ha, of which 11.88 ha are in the integrated forest-livestock system, with Piatã grass (*Brachiaria brizantha*) and eucalyptus, occupied with 35 steers in the rearing-fattening system for slaughter.

Area 4 is located on Estrada Tibiriçá, in the municipality of Iporã/PR, with a total area of 98.31 ha and soil with a sandy loam texture (SANTOS et al., 2018). In this area, 15.89 ha were selected for carrying out the work. An area of 11.91 ha has planted MG5 grass (*Brachiaria* *brizantha*), reformed in September 2019, and has been exploited with livestock, with 32 steers for fattening and slaughter. Finally, area 5 is located in Estrada Jacaré, municipality of Iporã/PR, with an area of 10.17 ha and soil with sandy loam textural class (SANTOS et al., 2018). The area is under lease, with a pasture of Piatã grass, reformed in December 2017. Currently, 8.12 ha are destined for livestock, to fatten for slaughter (12 steers), and 1.21 ha are leased for sheep farming.

For a better differentiation of the quantity, size of anthills, and approximate distance of material collection, wooden peels of the eucalyptus baluster type, 50 cm long and 5.0 cm wide, partially painted in white and signaling tapes were used to delimit the anthills and collect the geographic coordinates. From each identified and delimited anthill, 3 to 5 specimens were collected and subsequently stored in transparent acrylic tubes with lids (13 cm) containing 70% alcohol for conservation and later identification of the specimens. A total of 55 anthills and 217 specimens were sampled. The material collected was taken to the Laboratory of Biotechnology of Plant Products and Microorganisms at Universidade Paranaense (UNIPAR) for identification, at the genus level, using an identification key, described by Klingenberg and Brandão (2009), with the aid of a binocular stereoscopic microscope.

After collecting the data, with the help of the Autocad program, the areas of the anthills were calculated, using the method of the Institute of Rural Development of Paraná (IDR, 2021), multiplying the greatest length by the greatest width of the loose soil area of the anthill (murundum). Land use and occupation maps were prepared in the Autocad program after data collection with the Navcon® receiver, model SF 3040–RTK (GNSS technology), configured for the Datum Sirgas 2000 Fuso 22S. To calculate the spatial distribution of anthills in the sampled plots, the Morisita Dispersion Index (I) was used (MORISITA, 1959, DAVIS, 1993), in Equation 1.

$$I_\delta = n \cdot \frac{\sum x^2 - \sum x}{\left(\sum x\right)^2 - \sum x} \quad \text{(Equation 1)}$$

Where:

I_δ = Morisita Dispersion Index.,

$I^\delta > 1$, aggregate distribution,

$I^\delta < 1$, regular distribution,

$I^\delta = 1$, random distribution,

n = total number of sampling units (study areas);

Σx = sum of the number of anthills in the samples;

$\sum x^2$ = Sum to the square of individuals present in the sampling units.

To calculate the density of anthills ha^{-1}, the methodology proposed by Santos (2017) was used, namely, by dividing the number of anthills by the total area of occurrence. The results were expressions in anthills ha^{-1}.

RESULTS AND DISCUSSION

The data collected from the Navcon® SF 3040 equipment allowed the elaboration of land use and occupation maps, as well as maps of geolocation and area of anthills. The maps referring to land use and occupation showed: areas 1 and 2 (municipality of Altonia) showed a sampled area of 12.51 and 11.07 ha of pastures, respectively. Area 3 (Cafezal do Sul) had 11.88 ha of pasture, and areas 4 and 5 (Iporã) 11.91 and 9.33 ha, respectively, totaling 56.72 ha of sampled pasture.

The geolocation and area maps of the anthills were prepared from a coordinate, extracted in the center of each anthill, detecting a total of 55 anthills. The property located in the municipality of Cafezal do Sul (area 3) had the highest rate of leafcutter ant infestation, with 18 anthills identified, followed by the properties of Altônia (areas 1 and 2), which had 13 anthills each, and Iporã, where 7 (area 5) and 4 anthills (area 4) were observed.

According to Giesel et al. (2021), there is no relationship between the spatial distribution of anthills, quantity, and distribution of foraged vegetation. However, according to the same author, the spatial and temporal variation of plants selected for foraging can be influenced by environmental factors, especially those of abiotic origin such as temperature and humidity (GIESEL et al., 2020). The foraging process involves the selection of plant material that is influenced by several factors, such as morphological and nutritional characteristics, and especially the presence of secondary metabolism compounds present in foraged species (REED and CHERRETT, 2021). Secondary metabolites directly influence the palatability of the plant material, reducing its attractiveness, and may also have a direct toxic action on leafcutter ants or their symbiotic fungus (INFANTE-RODRÍGUEZ et al., 2019).

Although in this work the authors did not monitor and record the climatic conditions of the different regions studied, data from the literature indicate that different species of foraging ants tend to present changes in foraging habits in response to environmental changes. Maciel et al. (1995) verified that the species *Acromyrmex subterraneus subterraneus* Forel, 1893 responded to climate changes by changing the time of onset of foraging activity. Araújo et al. (2018) studying the species *A. laticeps nigrosetosus* Forel, 1908, recorded increased foraging activity during the night, observing a negative relationship between air temperature and ant flow in the foraging trails, as well as a positive correlation between percentage of relative air humidity and foraging activity of leafcutter ants. Tonhasca Jr. and Bragança (2000), in turn, found that, during the day, workers of the species *A. sexdens sexdens* tend to reduce foraging, and foraging activity is interrupted when temperatures reach 30°C.

Comparing the study areas, it is noteworthy that area 3 consists of an area intended for crop-livestock-forest integration, with low investment in practices to control leafcutter ants, in which the occurrence of anthills was observed in neighboring properties. Areas 1 and 2 are also poorly controlled areas, in terms of the occurrence of leafcutter ants, both in the sampled area and in neighboring areas, intended for the cultivation of eucalyptus. The lack of control over the years, therefore, promotes an increase in the incidence and size of anthills. Areas 4 and 5 have a history of control using homemade ant killers for 3 and 8 years respectively, thus showing a lower incidence of leafcutter ants (Figure 2).

These data indicate that the adoption of management, based on a higher frequency of application, is more efficient in controlling leafcutter ants, thus suggesting that areas 4 and 5 have lower infestation rates than the others, due to the management used by the owners in controlling leafcutter ants on their properties. Still, according to Giesel et al. (2021), these insects have the habit of foraging the green part of vegetables and the aerial part of trees and shrubs. The high infestation in pasture areas is related to the lack of management of neighboring properties, deforestation and abundance of plant materials. According to Reis Filho et al. (2013), leafcutter ants tend to adapt to open areas, with degraded areas used by ILPF systems (Integrated Crop-Livestock-Forest) highly vulnerable to the occurrence of large infestations of these insects, which attack both tree species and grasses, which can cause great losses to pastures.

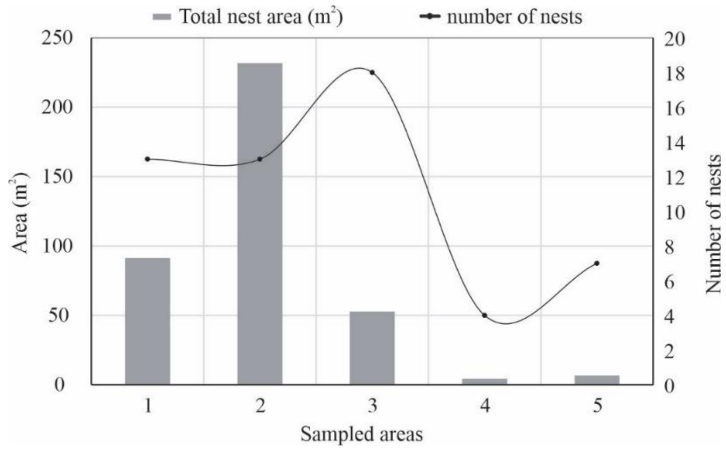

FIGURE 2 - Total nest area (m²) and number of nests sampled in areas 1 and 2 (Altônia), area 3 (Cafezal do Sul) and areas 4 and 5 (Iporã).

Areas 1 and 2 (both with eucalyptus planted in the neighboring area) located in the municipality of Altônia and area 3 (ILPF system), located in the municipality of Cafezal do Sul, showed a higher occurrence of leafcutter ants, since none of them have a plan of management for control and have availability of green biomass from pastures and tree plants, which makes these properties attractive to these insects. The area of the anthills sampled ranged from 0.26 to 97.34 m^2 of loose soil area, with an average of 77.25 m^2. It is evident that, even though area 3 had the highest number of anthills (18), area 2 had the largest total area of loose soil (231.38 m^2), when compared to the other areas analyzed: area 1 (91.2 m^2), area 3 (52.67 m^2), area 4 (4.36 m^2) and area 5 (6.62 m^2). Nickele et al. (2009), evaluating the density and size of anthills of *Acromyrmex crassispinus* in an area planted with *Pinus taeda* of different ages, found that the different size classes of anthills are related to their age, that is, the older, the greater its size. King (2021) carried out measurements in 200 nests of anthills over a period of 45 years in the same location, and documented the dynamics of anthills, analyzing volume, basal area, and surface area, and found that as the mounds aged, the size occupied on the surface of the pasture increased over the years. The aforementioned studies corroborate the present work, considering that the history of areas 2 and 3 shows that they are not managed and that, over the years, the anthills already installed have grown, causing greater damage to the property. Area 3, even with a greater number of anthills, has a smaller area. This is possible because the producer reformed the property's pasture in 2020, carrying out anthill control together, with a higher rate of loose soil on the surface.

The density of anthills ranged from 0.25 to 0.75 anthills ha^{-1}, where the lowest value was found in area 4, with a sampled area of 11.91 ha of pasture and 4 anthills, and the highest value in area 2, with 11.07 ha of pasture and 13 anthills identified (Figure 3). Areas 1, 3, and 5 had a density of 0.54 anthills ha^{-1}; 0.70 anthills ha^{-1} and 0.68 anthills ha^{-1} and an area of 12.51 ha, 11.88 ha and 9.33 ha of pasture, with a number of identified anthills of 13, 18, and 7, respectively.

Nickele et al. (2009) studying the incidence of leafcutter ants in Pinustaeda plantations, in the municipalities of Rio Negrinho and Três Barras (SC), evaluated the density of anthills (ha) in 3 areas, one containing newly planted Pinus (area 1), another with pine with 3 years of implantation (area 2) and a third area with pine with 6 years of implantation. In the first municipality studied, in area 1, an average of 1.54 anthills ha^{-1} was found; in area 2, 4.08 anthills ha^{-1}; and area 3, the average was 2.33 anthills ha^{-1}. In the second municipality, the density of anthills in areas 1 and 2 were higher than in Rio Negrinho and area 3, lower. According to the authors, this is probably because in Rio Negrinho, due to the pruning of the tree branches, the canopy of the six-year-old plantations was not closed, allowing the incidence of sunlight inside the forest, as observed in the areas with newly planted and three-year-old pine. This may have favored the occurrence of *A.*

crassispinus nests in all areas. Furthermore, the authors relate the density of *A. crassispinus* anthills with forest management. In Rio Negrinho, where the branches are pruned, there were no differences in the density of anthills in *P. taeda* plantations with different ages. On the other hand, in Três Barras, as the objective of the reforestation is the production of paper and cellulose, the branches are not pruned and, in this case, there were differences in the density of anthills.

Roglin et al. (2013), performing anthill control in degraded pasture areas, and using the MorisitaIndex (1959), obtained anthill density ranging from 3.0 to 15.5 anthills ha^{-1}, with loose soil area of 0.01 to 14.80 m² between study areas. This is justified by some factors, such as the size of the properties, the number of animals at pasture, the availability of plant materials and the management of the property over time (ROGLIN et al., 2013).

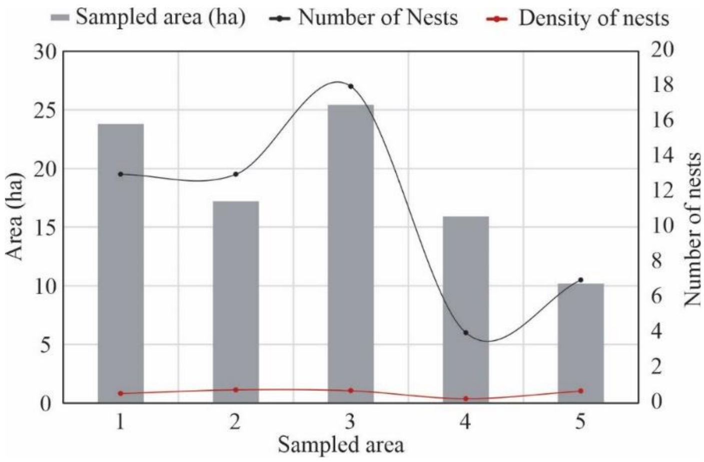

FIGURE 3 - Sampled area (ha), number of nests, and density of nests per sampled area.

The spatial distribution of anthills was calculated from the MorisitaIndex, which indicated aggregated distribution (I^{δ}=1.13), therefore, >1 for the five sample units. This type of distribution was also reported in surveys carried out by Silva and Ukan (2015), in a Eucalyptus benthamii forest plantation in the municipality of Irati/PR. The spatial distribution of aggregate-type anthills may be the result of the distribution of microhabitats, by mutualistic interactions, or by ramifications of the mother colony, where the heterogeneity of the environment directly influences the aggregation of nests (ROGLIN et al., 2013). According to Silva and Ukan (2015), this description coincides with the environment found in the area, which is a small plantation (1 ha) that does not undergo silvicultural treatments, which leads to competition between trees promoting the formation of clearings in the area, where a large aggregation of nests was observed. Around the plantation there are swamp areas, areas of native vegetation, and areas of agriculture, as observed in our study, in which it was possible to observe the difference in the number of anthills, indicating the existence of interaction between the ants and the environment (SILVA and UKAN, 2015).

Roglin et al. (2013), studying the spatial distribution of anthills in 5 recovery areas in the municipality of Paracatu (MG), also found values above 1 for the Morisita Index, (I^{δ}=1.66) indicating aggregate distribution for the five sample units studied, with a total of 149 anthills sampled. According to Souza et al. (2011), vegetation cover can reduce colonies by acting as a physical barrier and limiting the development of nests; nesting behavior after the flock are factors that affect the spatial distribution of anthills.

The specimens collected in the field from the 55 anthills sampled, were morphologically identified, based on the key proposed by Klingenberg and Brandão (2009). All samples were classified as belonging to the genus *Atta*. According to Lemes and Zanuncio (2019), leafcutter ants occur throughout the Neotropical region, i.e., from the south of the United States to the north of Argentina, except Chile. In Brazil, they occur throughout the national territory, differing only in the type of cutters that occur in each region. A survey carried out in the Umuarama region by Santos (2017) showed a high rate of leafcutterants infestation in the pastures, with the exclusive presence of the genus *Atta* in the evaluated areas.

The five areas sampled within the municipalities of Altônia, Iporã, and Cafezal do Sul, have the following distances, from areas 1 and 2 located in Altônia to areas 4 and 5 located in Iporã, have a distance of 21 km and 10 km, respectively, measured in Google Earth in a linear line, from areas 4 and 5 to area 3 located in Cafezal do Sul, with a distance of 15 km, and areas 1 and 2 to area 3 with a distance of 22 km.

According to Matsuyama (2017), the preference of ants of the genus *Atta* for plant species is selective, and depends on ecological determinants of the foraging strategy, such as the distribution of food resources in time, space, quantity, and quality; as well as competition with other colonies, and predation. The authors found that leafcutter ants are not selective when it comes to plant species, but in relation to leaves, flowers, and shoots, preferring younger, softer and fresher parts, which is what was observed in the present study.

Analyzing all the information expressed in this context, we conclude that there are no reports in the literature that explain the reason for the greater occurrence of a genus in different municipalities, countries, areas, regions, soil conditions, temperature, and type of foraging. Despite the distances between the sampled areas, Santos et al. (2017), that only the genus *Atta* occurs in the municipality of Umuarama, located 35 km from areas 1 and 2 located in Altônia.

It is observed that the occurrence of leafcutter ants in the properties may vary according to the management adopted. Active nests tend to increase in density over the years if left unchecked. However, the spatial distribution within the property is not uniform and is subject to conditions such as wind, natural barriers (eucalyptus, pine, etc.) and the adaptation of leafcutter ants.

According to Della Lucia et al. (2011), there is a need to expand studies related to the behavioral aspects of leafcutter ants in different regions, since these generate information that can help in the management of these insects in the various existing agroecosystems according to the particularities of each region. In this sense, the record of occurrence through georeferencing in areas of agricultural importance represents a valuable tool that helps in the control of leafcutter ants in pasture areas.

CONCLUSIONS

On the basis of the evaluation of monitoring and georeferencing data, it was possible to record the occurrence of leafcutter ants in pasture areas in the municipalities of Altônia, Cafezal do Sul, and Iporã, which presented varying data relating to the distribution and density of nests.

In all evaluated areas, a predominance of the genus *Atta* was registered.

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