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Diversity study and influence of apiculture flora on honey production in the municipality of Parelhas-RN

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ABSTRACT
The Brazilian semiarid has a floristic diversity of very interesting apicultural benefits, which can directly influence the productive results of such activity. In this context, the present work aimed to analyze the apicultural flora in two different realities (anthropized area and preserved area) and its influence on honey production. The municipality of Parelhas, where the experiment was located, is in the Seridó Potiguar microregion, in the southern center of RN. For this experiment, 30 Langstroth standard hives were used, divided into two nuclei of 15 hives each. They were about 2km apart. From September 1, 2018, to January 20, 2019, all colonies were weekly fed with 800ml of 1:1 water syrup and sugar. The old wax was changed to honeycomb wax in all hives. During flowering, a floristic survey of the surroundings of both areas studied was made differently. In the surroundings of nucleus 1, 46 botanical species of apiculture interest were found, and 12 species around nucleus 2. Regarding honey production, nucleus 1 presented an average of 37 kg per hive and 2 presented5 kg.
After all the procedures we verified that only core 01 obtained a higher honey production, and the results in this core were satisfactory.

Keywords: Beekeeping, Seridó, Semiarid, Flowering, and Productivity

1 INTRODUCTION

Brazilian legislation defines Mel as a food product that is produced by meliphery bees from the nectar collection of flowers or secretions from living parts of plants (BRAZIL, 2000). In beekeeping, the predominant bee species and the one that is most seen with the economic end in Brazil is the species of apis mellifera, which usually concentrates efforts on the collection of resources in plant species that has high energy gain via nectar Schimid-Hempel, (1987).

Plants regarding resource availability can be classified into three categories: nectariferous (produce only nectar), polyniferous (produce only pollen), and negariff polyniferous (produce nectar and pollen). (VILLANUEVA, 2002; BARTH, 2005), due to honey production and other hive products are linked to the presence of flowers, it is important to know the bee plants, their flowering periods and their abundance in a given region. Therefore, the characterization of plants and their flowering time contributes to the establishment of a sustainable beekeeping (Chaves and Gomes, 2002).

In Brazil, there is still little knowledge related to the beekeeping flora, especially the northeastern, although it is rich and diverse. Thus, needing to be more studied because it is declared one of the most potential areas for beekeeping in the country. (WENZEL, 1996). Flora investigation should be done according to the region where it is present, since plant species known as good nectar and pollen suppliers in one region may have low productivity in others, due to endophoclimatic conditions (Vidal, 2008). Although the region of Seridó Potiguar and the municipality of Parelhas do not have significant importance in the production of honey within the northeastern bee chain, it is noticeable that the region has a little explored potential taking into account the range of botanical species that are found mainly in the rainy season.

Honey consumption has been significantly increasing in recent years worldwide because people's search for natural products has been gradually advancing (Bertoldi, 2008). This search has encouraged greater honey production to meet consumers' demand, given food safety and a product free of any types of contaminants. In this context, the present work aimed to analyze the beekeeping flora in two distinct realities (anthropized area and preserved area) and its influence on botanical diversity and consequently on honey production

2 MATERIAL AND METHODS

2.1 LOCATION AND PERIOD OF THE EXPERIMENT

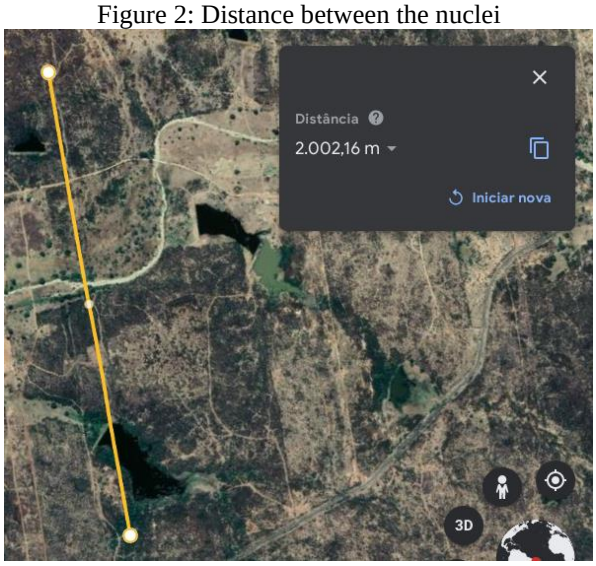
The experiment was conducted at the Aparius Queen Sertaneja, which is located in the Quinta do Meio community, located between the municipalities of Parelhas-RN and Santana do Seridó-RN (Figure 1) in the region of Seridó Potiguar, about 240km from the Christmas capital. The rural unit where the experiment was located is called Carnaubinha and has approximately 21 hectares. The experiment was conducted between September 2018 and July 2019.

Figure 1: Location of the municipality of Santana do Seridó-RN Source: Globo Rural

2.2 MANAGEMENT DURING THE EXPERIMENT

30 Langstroth types were used, divided into two nuclei of 15 hives each. The distance between the nuclei was approximately 2km (Figure 2). All hives have been fed weekly, always on Saturdays from September 1, 2018, until January 20, 2019. The geographical position of nuclei 1 and 2 was as follows: Nucleus 1. 6º 46'06 "s 36º42'46 "W and core 2. 6º46'18" S 36º41'42 "w.

Figure 2: Distance between the nuclei



Source: Google Earth

The feeding of the colonies of both nuclei was done as follows: 800ml of syrup per week for each colony. The composition of the syrup was water with sugar in the ratio of 1: 1. The feeders used were made with PVC pipe and pet bottles (Figure 3).

Figure 3. Feeder made with PET and PVC pipe refuse Source: Personal Archive (Ivan Júnior)

In addition to feeding, biweekly revisions were made to verify the general condition of the hives and also for the exchange of old fans for new alveolate wax. The exchange of the faces was made according to the individual need of each hive, in a way that all the hives had all their old fans exchanged. The two nuclei had sources of water (dams) just over 200 meters from each core.

2.3 CHARACTERIZATION OF FLORA AROUND THE NUCLEI

From January 20, 2019 biweekly, botanical species were collected from flowering separately around each nucleus. The flowers were identified (when possible) and stored in transparent plastic packaging. All botanical species found around each core were photographed. In the end there was the count of the amount of botanical species of beekeeping interest found around each core.

2.4 HONEY EXTRACTION AND AVERAGE PRODUCTION

Shortly after the beginning of the first rains in the region in 2019, the food was ceased and Melgueiras were placed in all hives. The amount of melgueira per hive ranged from 1 to 4 melgueiras according to the individual need of each.

Honey extraction was done individually in each nucleus. In the nucleus, 01 was made of two extractions (in June and July) and nucleus 02 only one extraction (in June). Quantitative extraction measurements were made separately by nucleus. The production was accounted for with the aid of buckets and a decanant tank with a capacity of 25kg and 300kg of honey respectively.

Honey was extracted in a hygienic unit in the municipality of Santana do Seridó-RN about 3km from the Apiary (Figure 5)

Figure 5. Honey extraction unit in the municipality of Santana do Seridó-RN

Source: Personal Archive (Ivan Júnior)

3 RESULTS AND DISCUSSION

The results related to the floristic survey and average productivity by a hive of nuclei 1 and 2 are described respectively in Tables 1 and 2.

Table 1 shows the floristic survey per core, where in core 1 were found 46 botanical species in flowering. Already in core 2 were found only 12.

Table 1. Botanical species found in each nucleus

Nº	Common name	Scientific name	Nucleus 1	Nucleus 2
01	Jetirana Branca	*Merremia aegyptia*	X	
02	Jetirana azul	*Ipomoea nil*	X	
03	Corda de viola	*Ipomoea purpurea*	X	
04	Malva de bode	*Herissantia tiubae*	X	
05	Malva amarela	*Sida golheirensis*	X	X
06	Cabeça de velho	*Euphorbia Leucocephala*	X	
07	Fato de Piaba	*Richardia grandiflora*	X	
08	Pega pinto	*Boerhavia diffusaL*	X	
09	Maracujá do mato	*Passiflora foetida*	X	
10	Bamburral	*Hyptis umbrosa*	X	
11	Alfazema de vaqueiro	*Hyptis suaveolens*	X	
12	Salsa	*Petroselinum crispum*	X	
13	Azedinha	*Oxalis articulata*	X	
14	Jurema Preta	*Mimosa tenuiflora*	X	X
15	Jurema Branca	*Mimosa verrucosa*	X	
16	Algaroba	*Prosopis juliflora*	X	
17	Chanana	*Turnera subulata*	X	
18	Xique xique	*Pilosocereus gounellei*	X	X
19	Jetirana Roxa	*Ipomoea cairica*	X	
20	Amor de velho	*Herissantia crispa*	X	
21	Catingueira	*Caesalpinia pyramidalis*	X	X
22	Juazeiro	*Ziziphus joazeiro*	X	X
23	Pau ferro	*Caesalpinea ferrea*	X	X
24	Feijão de rolinha	*Macroptilium lathyroides*	X	
25	Mata pasto	*Senna obtusifolia*	X	

26	Faveleira	*Cnidosculus Phylacantus*	X	X
27	Umbuzeiro	*Spondias tuberosas*	X	X
28	Urtiga	*Cnidosculus urens*	X	
29	Marmeleiro	*Croton blanchetianus*	X	X
30	Velame	*Croton campestris*	X	
31	Mofumbo	*Combretum leprosum*	X	
32	Umburana	*Amburana cearensis*	X	X
33	Carnaúba	*Copernicia prunifera*	X	
34	Unha de gato	*Ficus pumila*	X	X
35	Quixabeira	*Sideroxylon obtusifolium*	X	X
36	Rasteirinha	*Ipomea obscura*	X	
37	Mudubin	*Portulaca oleracea*	X	
38	Cabeça de touro	*Kallstroemia maxima*	X	
39	Rasga peito	*Mimosa pudica*	X	
40	Camapu	*Physalis angulata*	X	
41	Pinhão manso	*Jatropha gossypiifolia L.*	X	
42	Malva rosa	*Melochia tomentosa*	X	
43	Malva rasteira	*Sida ciliaris*	X	
44	Perpétua	*Gomphrena globosa*	X	
45	Leucena	*Leucaena leucocephala*	X	
46	Angico	*Anadenanthera colubrina*	X	

Even the nuclei 01 and 02 being in the same municipality, on the same property, about 2km from each other, core 01 presented a diversity of plants almost 4 times larger than in nucleus 02. One of the factors that can explain this difference is anthropization. In the vicinity of core 02 there are several exploratory activities of local natural resources that, despite generating employment for the community, causing environmental impacts. One of the activities is deforestation for the exploitation of extensive cattle. Another activity that also degrades is the innatlation of a wind energy company, where it installed a test tower near core 02, which led to deforestation on the outskirts of the tower. Another fact that should be taken into consideration is deforestation made mainly around nucleus 02, with the objective of marketing wood for several ceramist companies that make brick and tile and use the burning of firewood as an energy matrix for the feeding of companies' ovens. And finally in core 2 areas there is an area deforested by a mining company.

Medeiros 2004, states that the ceramist sector of the municipality of Parelhas-RN deserves to be highlighted among the new segments that emerged in the municipality, the author also states that the municipality has 29 companies in the field. Data from ADESE/DTZ 2007 show that the municipality of Parelhas is the largest firewood consumer in the Seridó region, consuming a monthly total of 7552 cubic meters of wood.

The practice of plant extractivism in the caatinga for feeding ceramic furnaces is worrying. According to Cosme Júnior (2011), the municipality of Parelhas shows an increase in the degradation of vegetation cover. According to De Lunda Galindo (2008) the economy of the semiarid is based on low-productivity agriculture and extensive livestock, but this anthropic pressure in the semiarid tends to be

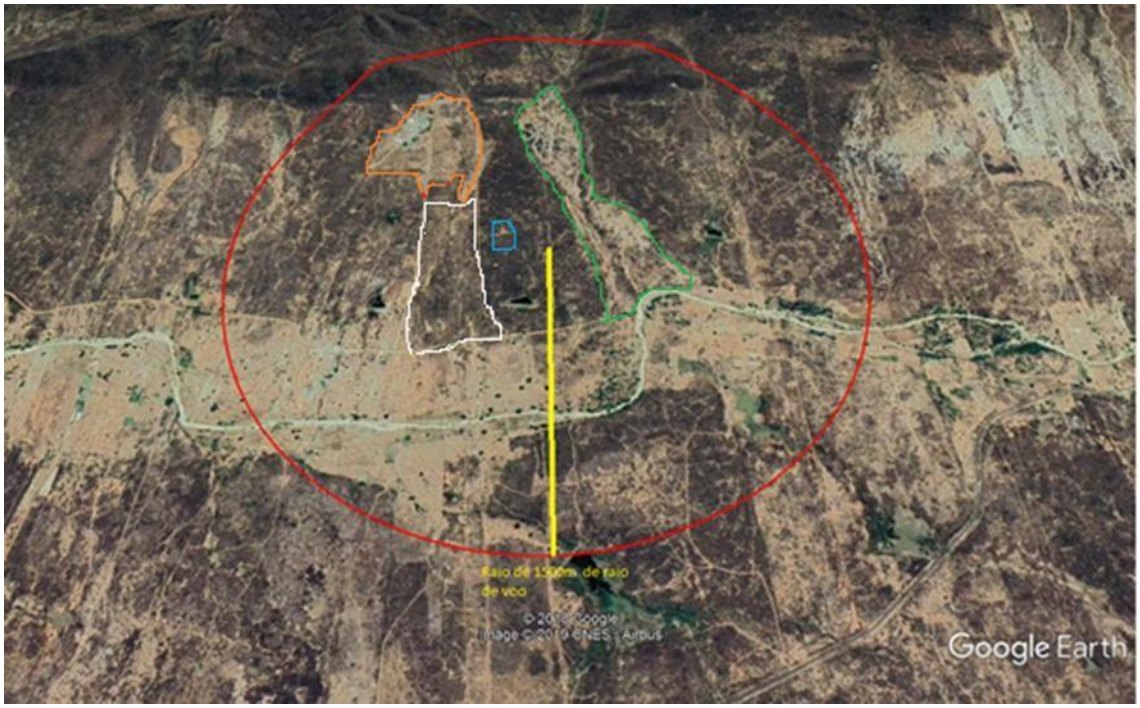
expressive, as man seeks to meet his needs and uses a model exploration not compatible with caatinga, thus creating pre-conditions for the formation of degraded areas, where the most harmful consequence is the installation of the desertification process.

The energy generated by the (wind) winds is admittedly a clean and renewable source of electricity, but for Neri; Jameli; Bernard, et al., Melo (2019) she has a negative side, which causes non -negligible environmental impacts, such as animal death and especially native vegetation destruction.

There is a positive relationship between the maintenance of forests and the diversity of plant species. The same authors also mention that the maintenance of forests is one of the most established forms of conservation of biodiversity, but this need contrasts with the anthropic use of natural areas. (PARDINI, et al. (2010), Ferreira, et al., (2015), Rocha-Santos, et al., 2017).

Analyzing the flora of beekeeping interest of a preserved area in the municipality of Caraúbas-RN, Benevides, and Carvalho (2009), 41 species of beekeeping interest in that locality. In the municipality of Assu-RN, conducting a floristic survey of beekeeping interest, Costa (2015) found in the rainy season 50 species, very approximate numbers when compared to the number of species found on the outskirts of core 1 of this research.

Figure 6: Flight radius from nucleus 2 bees to the center, touched by anthropized areas.



Source: Google Earth

The designed areas correspond to the location of the orange mine, exploration of blank cattle, blue wind energy test tower area, and logging for green wood.

Regarding honey productivity by Colmeian the two nuclei, the target productive data of this work is shown in Table 2.

Table 2, presents the productivity and extraction period of each nucleus.

Table 2. Average honey productivity by hive per core and extraction.

Nucleus	1st extraction month June	2nd Extraction Month July	Average productivity
01	25 Kg	12Kg	37Kg
02	05Kg	00Kg	5Kg

Source: Silva, Sousa e Lima-Junior (2019)

In core 01, in the first extraction in June, a 300 kg decanant tank was extracted and 3 more buckets of 25kg, while in core 02 in the same month was extracted only 3 buckets were, totaling 375kg in nucleus 01 and 75kg in core 02 . Already in July, there was production only in nucleus 01, where 08 buckets were extracted, totaling 200kg of honey.

Hive honey productivity comparing nucleus 1 with nucleus 2 shows that core 1 besides having two honey extractions, had productivity 7.4 times larger than core 2, even the two nuclei having exactly the even management throughout the experimental period. This fact is most likely to the floristic diversity found on the outskirts of core 01 and the proximity of nucleus 01 for the main flowering, which unlike nucleus 02 has no mining, plant extractivism (for wood removal), cattle, and deforestation due to due to Wind energy, besides having nearby more wetlands near an almost dry dam where most plant species of beekeeping interest was found on the outskirts of nucleus 01.

When it comes to floristic diversity for exclusive honey production, the botanical species are excluded whose main floral resource is pollen. Aliating the fact that the main plant supplier plants are known in the two target areas of this research, one can list the main nectar supplier plants (honey raw material) that most contributed to honey production in nuclei 1 and 2 (Table 3).

Table 3. Main plants nectar suppliers in nuclei 1 and 2

Nº	**Common name**	**Scientific name**	**Nucleus 1**	**Nucleus 2**
01	Jetirana Branca	*Merremia aegyptia*	X	
02	Jetirana azul	*Ipomoea nil*	X	
03	Corda de viola	*Ipomoea purpurea*	X	
04	Malva de bode	*Herissantia tiubae*	X	
05	Malva amarela	*Sida golheirensis*	X	X
06	Cabeça de velho	*Euphorbia Leucocephala*	X	
07	Fato de Piaba	*Richardia grandiflora*	X	
08	Bamburral	*Hyptis umbrosa*	X	
09	Alfazema de vaqueiro	*Hyptis suaveolens*	X	
10	Salsa	*Petroselinum crispum*	X	
11	Algaroba	*Prosopis juliflora*	X	
12	Jetirana Roxa	*Ipomoea cairica*	X	
13	Amor de velho	*Herissantia crispa*	X	
14	Faveleira	*Cnidosculus Phylacantus*	X	X
15	Umbuzeiro	*Spondias tuberosas*	X	X
16	Urtiga	*Cnidosculus urens*	X	
17	Marmeleiro	*Croton blanchetianus*	X	X
18	Velame	*Croton campestris*	X	
19	Rasteirinha	*Ipomea obscura*	X	
20	Mudubin	*Portulaca oleracea*	X	
21	Pinhão manso	*Jatropha gossypiifolia L.*	X	
22	Malva rosa	*Melochia tomentosa*	X	
23	Malva rasteira	*Sida ciliaris*	X	
24	Perpétua	*Gomphrena globosa*	X	

As can be observed in Table 3, the number of nectar supplier plants found around core 1 is six times larger than in core 2, which gives more backing to the productive results found.

As cited by Silveira 1983, the beekeeper who wants to have the maximum honey production in his hives should know mainly the nectar and pollen sources near his apiary, as well as the biology and behavior of bees.

Analyzing the production of honey in 60 hives of Apis Mellifera in a preserved caatinga area in the municipality of Petrolina-PE, Ribeiro et al. 2007 observed honey production ranging from 45 to 50kg per hive per year, results similar to those found in this work.

4 CONCLUSION

With the results found, it is concluded that the knowledge of the region's beekeeping pasture is extremely important.

It is also concluded that through the knowledge of the beekeeping pasture, there is a real possibility of planning productively according to local floristic reality.

It is also concluded that from an ecological and economic point of view, it is worthwhile for the beekeeper to avoid actions that cause anthropization, because floristic diversity regenerates in preserved forest conditions and beekeeping responds positively in production. This will also influence the conservation of the life of bees and also of humanity. Since, without bees, without food.

Taking into consideration that in core 1 where the surroundings were preserved, the production was 37kg of honey/hive/year, this has a total of 555kg of honey produced. Being this honey fractioned, flooded and labeled adds value to the product, where it is marketed to the end consumer for $ 40.00/kg which would add an annual revenue of $ 22,200.00 in just 15 hives. Thus, it is concluded that it is economically viable to know, preserve and sustainably exploit the floristic resources of a locality with the purpose of bee production.

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