

INTRODUCTION

Palynological analysis of bee products encompassing qualitative and quantitative methodology is of great significance in apiculture. Identification of bee flora from diverse geographic areas and floristic communities helps in the development of beekeeping industry.

In Brazil, palynological studies of bee products throughout different biomes have been carried out. These studies have contributed to the development of apicultural activities.

“Jataí” bee (*Tetragonisca angustula* Latreille, Figure 1) is a very common native bee occurring in several South American countries. Our study focused on pollen samples stored by this bee species.

These samples were obtained inside Brazilian Amazonia. So, this work is aimed at presenting a pollen spectrum which contributes to know better the regional bee flora and to improve beekeeping activity.

STUDY AREA

The analyzed samples were collected at Belterra, Pará State, Brazil. (Figure 2). Pará is located inside Brazilian Amazonia, the largest Tropical Forest region around the world. Furthermore, this region presents many species of native bees (Hymenoptera: Apidae: Meliponinae), about which we still have insufficient scientific studies.

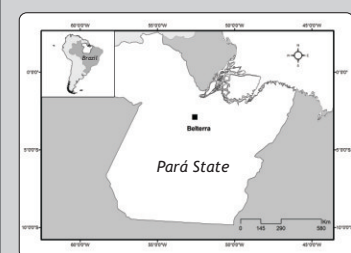


Figure 2. Map showing Belterra municipality, Pará State, Brazil.

Beekeeping is a common activity practiced at Belterra municipality (Figures 3 and 4). In this, stingless bees have contributed to improve the local income. Honey, pollen and swarm sale are frequent over there.



Figure 3. Beekeepers' Association at Belterra municipality, Pará State, Brazil.

METHODS

The samples were acetolyzed according to standard methodology in Palynology, using acetolysis (Erdtman, 1960). After slides mounting, 500 pollen grains were counted per sample, at least. Next, frequency classes were determined: Predominant Pollen (PP, >45%), Secondary Pollen (SP, 16-45%), Important Minor Pollen (IM, 3-15%) and Minor Pollen (MP, <3%) (Louveaux *et al.*, 1978).

After pollen samples have been collected (Figure 5), laboratory procedures were carried out, according to the following steps:

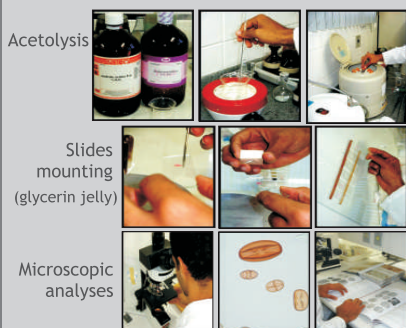


Figure 4. Meliponary situated at Belterra, PA, Brazil.



Figure 5. Jataí bee colony at Belterra, PA, Brazil.

RESULTS and CONCLUSIONS

Table 1. Pollen spectrum of pollen samples stored by *Tetragonisca angustula* Latreille (Apidae, Meliponinae) at Belterra, Pará State, Brazilian Amazonia.

Plant family	Pollen type	Sep	Oct	Nov	Dec
Achariaceae	<i>Lindackeria paludosa</i>	-	-	-	16.25
Amaranthaceae	<i>Alternanthera philoxeroides</i>	2.74	22.66	-	-
	<i>Amaranthus viridis</i>	3.94	6.23	-	0.36
Anacardiaceae	<i>Tapirira retusa</i>	0.51	0.35	2.81	6.14
Araliaceae	<i>Schefflera</i>	37.16	41.87	-	2.53
Arecaceae	<i>Astrocaryum</i>	-	0.17	-	-
Asteraceae	<i>Conyza floribunda</i>	2.05	1.38	-	-
	<i>Mikania</i>	2.57	2.25	-	2.53
	<i>Vernonia grisea</i>	0.34	0.17	-	-
Bignoniaceae	<i>Tabebuia</i>	13.18	4.50	0.19	5.05
Burseraceae	<i>Protium</i>	-	-	5.99	-
Fabaceae/Caesalpinioideae	<i>Senna/Cassia</i>	-	1.56	0.19	1.44
Fabaceae/Mimosoideae	<i>Mimosa pudica</i>	3.42	1.04	-	-
Goupiaceae	<i>Goupia glabra</i>	2.23	3.29	-	-
Lamiaceae	<i>Hyptis</i>	3.42	0.52	-	-
Melastomataceae	<i>Clidemia</i>	-	-	-	0.18
Moraceae	<i>Brosimum paraense</i>	-	-	-	31.23
Myrtaceae	<i>Eugenia stipitata</i>	-	-	8.43	5.05
	<i>Myrcia citrifolia</i>	0.34	-	0.37	-
Rubiaceae	<i>Borreria laevis</i>	25.68	14.01	-	9.03
Sapotaceae	<i>Pouteria</i>	0.68	-	-	-
Urticaceae	<i>Cecropia</i>	1.20	-	82.02	20.22
Unidentified	Type 1	0.17	-	-	-
	Type 2	0.34	-	-	-
		100.00	100.00	100.00	100.00

Figure 6. Pollen types (>10%) found in pollen samples stored by *Tetragonisca angustula* Latreille at Brazilian Amazonia: A. *Alternanthera philoxeroides* (Amaranthaceae). B. *Borreria laevis* (Rubiaceae). C. *Brosimum paraense* (Moraceae) D. *Cecropia* (Urticaceae). E. *Lindackeria paludosa* (Achariaceae). F. *Schefflera* (Araliaceae). G. *Tabebuia* (Bignoniaceae). (Magnitudes: A,C,D,E: 1.000×; B,F,G: 400×)

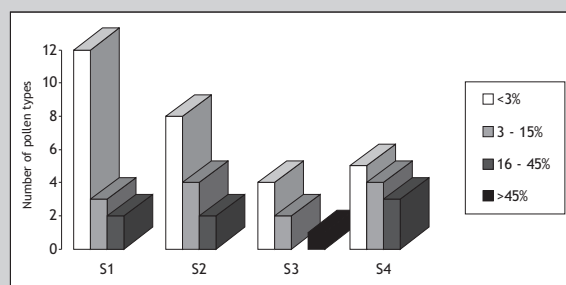
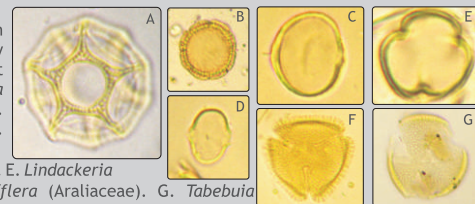


Figure 7. Frequency of pollen types in pollen samples stored by a stingless bee species at Belterra, Pará State, Brazilian Amazonia. (S: sample)

Many pollen types were found in the analyzed pollen samples (Table 1). The following plant families were well represented in the pollen spectrum: Achariaceae, Amaranthaceae, Araliaceae, Bignoniaceae, Moraceae, Rubiaceae and Urticaceae. These cited families presented their pollen types with frequencies above 10% (Figure 6). MP and IM classes were the most represented pollen classes (Figure 7).

Six pollen types should be pointed out due to their high percentages in two samples, at least: *Cecropia* (PP, SP), *Schefflera* (SP), *Borreria laevis* (PP, IM), *Amaranthus viridis* (IM), *Eugenia stipitata* (IM) and *Tabebuia* (IM). These pollen types should indicate important plants for native bees at Brazilian Amazonia and future studies are necessary to deepen these knowledge.

ACKNOWLEDGMENTS

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LOUVEAUX, J.; MAURIZIO, A.; VORWOHL, G. Methods of melissopalynology. *Bee World*, 59: 139-157, 1978.

INTRODUCTION

Caatinga is an entirely Brazilian biome. It has a rich flora available for many insects' species, including exotic and native bees.

To know this flora as well as the ecological relationships established between plants and their pollinators is an important tool to propose efficient strategies for environmental conservation.

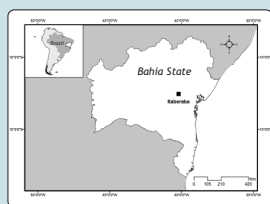
Palynological analyses have contributed to improve the knowledge about botanical characteristics of bee products such as honey, pollen loads and propolis. Among these, honey is the most common bee product used by people around the world.

In this, our work is aimed at identifying the pollen types found in *jataí* bee (*Tetragonisca angustula* Latreille) honey samples, provided by beekeepers from Bahia State, Brazil. This bee species can be found in many municipalities along the Bahian Semi-Arid.



Caatinga vegetation, NE Brazil.

STUDY AREA



Location of the study area, Itaberaba, BA, Brazil.

This study was carried out in a Caatinga vegetation area, municipality of Itaberaba, Bahia State, Brazil.

The Caatinga is characterized by a long period without rain, often from six to seven months between May and November. It has a seasonal climatic rhythm that completely influences the regional hydrology.

The rainfall patterns are different from the humid areas of Brazil, with a long drought period that means the phreatic zone often relies on rivers to maintain its water level during the dry season.

METHODS

Honey samples were collected from colonies of *Tetragonisca angustula* Latreille (Apidae, Meliponinae).

Standard melissopalynological method, using ETOH for honey dilution and acetolysis, was used to preparing the honey samples. The pollen grains in the acetolyzed honey sediments were identified and counted (500 per sample) by microscopic analysis to determine the frequency classes (Louveau *et al.*, 1978): Predominant Pollen (PP, >45%); Secondary Pollen (SP, 16-45%); Important Minor Pollen (IM, 3-15%); Minor Pollen (MP, <3%).

Laboratory procedures were carried out, including the following steps:

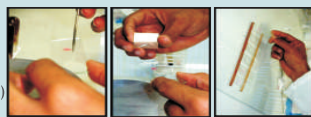


Meliponiculture scenes at Brazilian Caatinga vegetation.

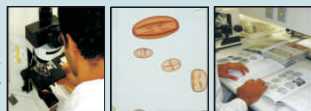
Acetolysis



Slides mounting (glycerin jelly)



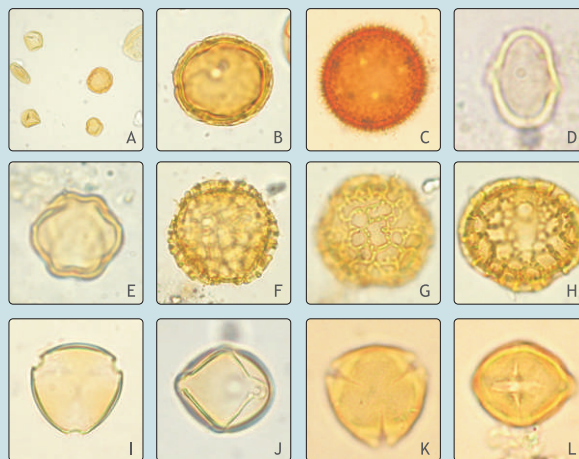
Microscopic analyses



RESULTS and CONCLUSIONS

Pollen spectrum of honey samples produced by *Tetragonisca angustula* Latreille (Apidae, Meliponinae) at Itaberaba, Bahia State, Brazil.

Plant Family	Pollen Type	Pollen classes
Amaranthaceae	<i>Amaranthus viridis</i>	MP
Anacardiaceae	<i>Schinus</i>	MP
Apocynaceae	Apocynaceae type (tricolporate, psilate)	MP
Arecaceae	<i>Syagrus</i>	MP
Asteraceae	<i>Aspilula hispidantha</i>	MP
	<i>Conocliniopsis prasiifolia</i>	MP
Malvaceae/Bombacoideae	<i>Pachira aquatica</i>	MP
Malvaceae/Sterculioideae	Sterculiaceae type	MP
Euphorbiaceae	<i>Ricinus communis</i>	MP
Flacourtiaceae	<i>Casearia commersoniana</i>	MP
Leguminosae	<i>Delonix regia</i>	IM, MP
	<i>Prosopis juliflora</i>	PP, SP
	<i>Mimosa tenuiflora</i> /M. <i>verrucosa</i>	MP
	<i>Mimosa</i> sp.	MP
Malpighiaceae	<i>Banisteriopsis</i>	IM
Melastomataceae	<i>Clidemia</i> /Miconia	IM
Moraceae	<i>Cecropia</i>	IM
Nyctaginaceae	<i>Boerhaavia</i>	IM
Poaceae	<i>Andropogon</i>	MP
Solanaceae	<i>Solanum paniculatum</i>	SP



Photomicrographs of some pollen types found in honey samples of *Tetragonisca angustula* Latreille from Bahia State, Brazil. A. General field on microscope. B. *Banisteriopsis*. C. *Boerhaavia*. D. *Cecropia*. E. *Clidemia*. F-H. *Delonix regia*. I-J. *Prosopis juliflora*. K-L. *Solanum paniculatum*. (Images out of scale)

Pollen types that have represented important plant species at Caatinga (according to some pollen studies), such as *Prosopis juliflora* (Leguminosae), can tolerate adverse conditions of water stress, and their availability for bees becomes even more noticeable when most other species suffer under the high temperature and insolation levels of the dry season.

Our data highlight the range of plants probably offering resources (pollen and - or - nectar) for native bees' communities in the study area. Some of these plant species ought to be appreciated for apicultural activities aiming at increasing the honey regional production.

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