SCIENTIFIC COMMUNICATION

A SURVEY OF THE ENTOMOFAUNA ASSOCIATED WITH THE INFLORESCENCES OF PEJIBAYE (ARECACEAE: *BACTRIS GASIPAES* KUNTH) IN THE RIBEIRA VALLEY, SP, BRAZIL

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ABSTRACT

The cultivation of pejibaye (*Bactris gasipaes* Kunth) has been expanding in Brazil, especially in the Vale do Ribeira, SP, where the edaphoclimatic condition is compatible with its production. With the purpose of learning about insects that visit the inflorescence of pejibaye, a survey was conducted at Polo Regional do Vale do Ribeira, located in the municipality of Pariquera-açu, SP, Brazil, and on a private property located in the municipality of Registro, SP, areas where selected pejibaye palm trees from Yurimaguas, Peru, are grown. During the month of January of 2006 and 2007, yellow sticky insect traps were placed at the inflorescences of different pejibaye matrices, soon after the bracts opened. The traps were kept throughout female and male anthesis, and removed at the end of the cycle, which lasted for about 72 hours. The 9,743 insects collected were then separated, counted, and identified according to their orders. It was observed that the most frequent insects on the inflorescence of pejibaye palms in the Vale do Ribeira, SP are Diptera, Coleoptera, and Hymenoptera.

KEY WORDS: Sticky trap, visiting insects, pejibaye, heart of palm.

RESUMO

LEVANTAMENTO DA ENTOMOFAUNA ASSOCIADA ÀS INFLORESCÊNCIAS DE PUPUNHEIRA (ARECACEAE: *BACTRIS GASIPAES* KUNTH) NO VALE DO RIBEIRA, SP. A cultura da pupunheira (*Bactris gasipaes* Kunth) vem se expandindo no Brasil, especialmente no Vale do Ribeira, SP, onde encontra condição edafoclimática compatível à sua produção. Com o objetivo de conhecer os insetos visitantes da inflorescência da pupunheira, foi realizado levantamento em duas áreas de coleção de pupunheiras selecionadas originárias de Yurimaguas, Peru, no - Polo Regional do Vale do Ribeira – APTA/SAA-SP, localizado no Município de Pariquera-açu, SP, e em uma propriedade particular no Município de Registro, SP. Durante o mês de janeiro de 2006 e 2007, foram instaladas armadilhas adesivas entomológicas amarelas em inflorescências de diferentes matrizes de pupunheira logo após a abertura de suas brácteas, as quais foram mantidas durante a antese feminina e masculina e retiradas no término do ciclo, cerca de 72 horas. Efetuou-se a separação, contagem e identificação ao nível de ordem dos 9.743 insetos totais coletados. Verificou-se que os insetos mais frequentes na inflorescência da pupunheira no Vale do Ribeira, SP, pertencem às ordens Diptera, Coleoptera e Hymenoptera.

PALAVRAS-CHAVE: Armadilha adesiva, insetos visitantes, pupunha, palmito.

The family Arecaceae, formerly known as Palmae, is comprised of plants of the division Magnoliophyta, class Liliopsida, and it is the only plant family of the order Arecales. The flowers and fruits of these plants play an important role in the survival of insects, birds, and other animals as they provide them with food and shelter. This family is also of ecological value within the plant community in

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the rainforests, and in the interaction network with pollinators and dispersers. Knowledge about these animals and their relationship with the environment not only provides subsidies for practices, but also for maintenance of their population at desirable levels (Amaral; Alves, 1979).

The pejibaye palm (*Bactris gasipaes* Kunth) is an Arecaceae species whose cultivation has been expanding in Brazil, particularly in the Vale do Ribeira, SP, Brazil, where the edaphoclimatic condition is compatible with its growth requirements. The area of cultivated pejibaye in the state of São Paulo is presently estimated to be over 3,900 ha (Anefalos et al., 2007), and on the southern coast of that state - a region known as the Ribeira Valley – it is estimated that more than 450 producers have been growing pejibaye for heart of palm, with the number of this palm tree at approximately 11 million (São Paulo..., 2008).

Pejibaye is a monoecious plant, with male and female flowers on the same inflorescence and the prevalence of cross-fertilization, which makes it dependent on agents, such as wind, insects, and gravity for pollination to occur. It produces fruit from February to May, and several factors such as nutrition, poor pollination, drought, competition, attack of insects and diseases may either cause abortion, or contribute to a low average cluster weight (Bovi, 1998; Clement, 1999).

Its inflorescence is protogynous (the female flower matures before the male), and the pollination cycle lasts for about three days. On the first day the bract enveloping the inflorescence opens, and the female anthesis occurs, keeping the pistillate flowers fertile for over 24 hours. In the late afternoon of the second day the male anthesis occurs, and during the morning of the third day pollen is released (Lima, 1955; Mora-Urpi; Solis, 1980; Schroeder, 1978).

There is little scientific research on insects that visit the inflorescence of pejibaye palms as the height of the matrices makes it difficult to collect them, especially the pollinating ones. MORA-URPI (1982) points out the important role insects of the order Coleoptera play in the pollination of *Bactris* in Costa Rica – the families Curculionidae and Nitidulidae in particular - also described by Henderson et al. (2000) in a survey conducted in lowland forests in the Amazon. However, it is unknown yet the insects visiting the inflorescence of the species B. gasipaes conditions in the Vale do Ribeira, SP, this information can come to collaborate on future work in the detection of potential pollinators, has led us to carry out this study.

A survey of insects associated with the inflorescence of pejibaye palms was conducted at at two different locations, as follows:

Polo Regional do Vale do Ribeira, Sao Paulo of the Agência Paulista de Tecnologia dos Agronegócios, a subsidiary of the Secretaria de Agricultura e Abastecimento do Estado de São Paulo, located in the municipality of Pariquera-açu, SP, where a collection of selected pejibaye palms from Yurimaguas, Peru was planted in the '90s.

a private property located at neighborhood of Serrote, in the municipality of Registro, SP, where pejibaye matrices - also planted in the '90s - are interspersed with commercially produced heart of palm.

First, in the month of December the matrices with closed bracts were located and marked, since each palm flowers only once a year, between the months of January and March. After they were mapped, the plants were monitored twice a day – in the morning and in the late afternoon – in order to verify which inflorescences had opened.

As bracts opened, a yellow sticky insect trap measuring 25 cm x 5 cm was placed a metal hook at the inflorescence with the aid of a telescopic pole 15 meters in height. Traps were kept at each inflorescence for about 72 hours, and then removed, numbered, and stored in boxes. The direct collection, with net or bags, was not performed due to the difficulty of access to the inflorescence (plant height of about 15 meters) in addition to gathering with adhesive trap enabled that the collection continued for several days, while a collection with net or bag would be momentary.

For the study of the first blossoming (Year 1), 24 traps were placed on different matrices on two distinct sites at Polo Regional do Vale Ribeiro - plain (site 01) and hill (site 02) - in January, 2006. During this period, rainfall totaled 111.7 mm; the highest average temperature was 30.1º C, and the lowest average temperature, 19.4º C. For the same period, on the private property in Registro city, where 10 traps were used, rainfall totaled 168.8 mm, the highest average temperature was 32.5º C, and the lowest average temperature, 21.3º C. After the traps were removed, the insects collected were separated, counted, and identified according to their orders at the Laboratório de Entomologia of Universidae Estadual Paulista (UNESP), experimental campus in the city of Registro.

In the subsequent year (Year 2), 25 traps were placed at the inflorescences of different matrices at Polo Regional do Vale Ribeiro - on the same sites as those of the previous year (site 01 and site 02) - in January, 2007. During this period, rainfall totaled 197.8 mm, the highest temperature averaged 31.0º C, and the lowest temperature, 20.7º C. On the site of the private property in Registro, where one trap was used, the total rainfall recorded was 251.7mm; the highest average temperature was 31.5ºC, and the lowest average temperature, 21.7º C. Separation, counting, and identification of the insects collected

- according to their orders - were carried out at the Laboratório de Entomologia of the Instituto Biológico in the city of São Paulo.

The average numbers of insects collected per trap were 182.1 and 136.6 for 2006 and 2007 respectively.

In the first year of the survey (Year 1), a total of 6,134 insects were collected with the 34 traps used at the three sites. As it can be observed on Table 1, most of them are Diptera (3,571 individuals), and account for 57.68% of the total of insects collected (Fig. 1) - more than twice the number of insects of the order ranked second largest, present in the survey - 1,476 coleoptera, or 23.84% of the total. There were 886 insects of the order Hymenoptera, and only 139 of the order Hemiptera. Other orders, such as Neuroptera, Lepidoptera and Orthoptera, accounted for 119 individuals, or 1.92% of the total.

In the subsequent year (Year 2), a total of 3,552 insects were obtained from 26 sticky traps placed at the three insect-collecting sites (Table 2). The number of individuals of the order Diptera was higher than that of other orders – 1,351, or 38.03% of the total of insects collected, followed by the orders Coleoptera and Hymenoptera, with 1,086 (30.57%) and 1,035 (29.14%) individuals respectively (Fig. 2). Under "Others" – an order group which accounted for 1.04% of the total of insects in Year 2, individuals of the order Dictyoptera, Neuroptera, Lepidoptera and Orthoptera.

Table 1 - Absolute values in units (F abs) and relative values in % (F rel) distributed as per order, and number of insects collected at inflorescences of pejibaye (*Bactris gasipaes* Kunth) in different collecting sites: sites 1 and 2 - located at the Polo Regional do Vale do Ribeira, municipality of Pariquera-açu, SP, and a commercial area in the municipality of Registro, SP (2006).

	Collecting sites					
Year 1	Polo Regional do Vale do Ribeira – site 1	Polo Regional do Vale do Ribeira – site 2	Commercial area			
Order	F abs (u)	F rel (%)	F abs (u)	F rel (%)	F abs (u)	F rel (%)
Coleoptera	1,115	26.66	239	21.40	122	13.68
Diptera	2,273	54.35	783	70.10	515	57.74
Hemiptera	102	2.44	17	1.52	20	2.24
Hymenoptera	642	15.35	75	6.71	169	18.95
Others	50	1.20	3	0.27	66	7.40
Total	4,182	100	1,117	100	892	100

Table 2 - Absolute values in units (F abs) and relative values in % (F rel) distributed as per order, and number of insects collected at inflorescences of pejibaye (*Bactris gasipaes* Kunth) in different collecting sites: sites 1 and 2 - located at the Polo Regional do Vale do Ribeira, municipality of Pariquera-açu, SP, and a commercial area in the municipality of Registro, SP (2007).

	Collecting sites					
Year 2	Polo Regional do Vale do Ribeira – site 1	Polo Regional do Vale do Ribeira – site 2	Commercial area			
Order	F abs (u)	F rel (%)	F abs (u)	F rel (%)	F abs (u)	F rel (%)
Coleoptera	511	24.53	415	37.05	160	45.85
Diptera	689	33.08	492	43.93	170	48.71
Hemiptera	29	1.39	14	1.25	0	0.00
Hymenoptera	834	40.04	182	16.25	19	5.44
Others	20	0.96	17	1.52	0	0.00
Total	2,083	100	1,120	100	349	100

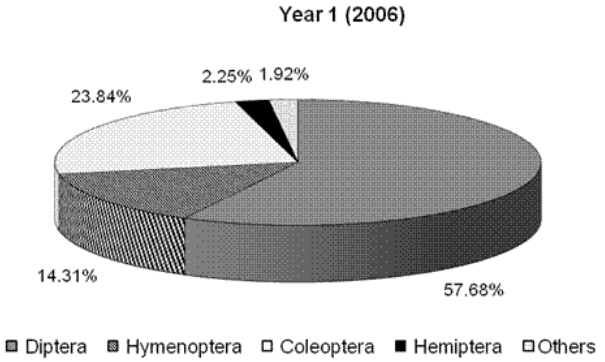

Fig. 1 - Relative Values (%) for the total of insects collected at inflorescences of pejibaye matrices (*Bactris gasipaes*) in the Vale do Ribeira, SP, in Year 1 (2006), distributed as per order.

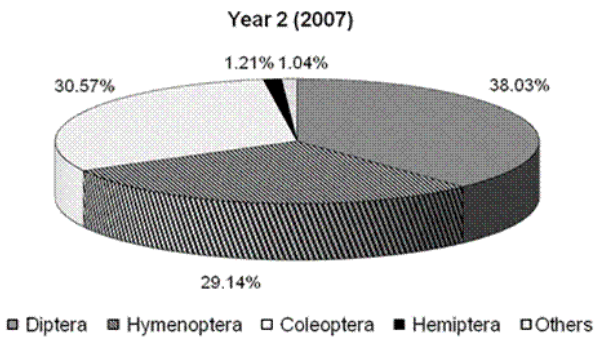

Fig. 2 - Relative Values (%) for the total of insects collected at inflorescences of pejibaye matrices (*Bactris gasipaes*) in the Vale do Ribeira, SP in Year 2 (2007), distributed as per order.

It was observed that the most frequent insects on the inflorescence of pejibaye palms in the Vale do Ribeira, SP in both periods of study (Year 1 and Year 2) are of the orders Diptera, Coleoptera and Hymenoptera. These results are similar to those obtained by Cembranelli et al. (2001), who concluded that the most important pollinators for the pejibaye palm are insects of these orders, as they quite often visited the inflorescences studied in the municipality of Ubatuba, SP. Thum; Costa (1998/1999) also observed, on *Arecastrum romanzoffianum* in Santa Maria, RS, insects of the orders Hymenoptera, Coleoptera, Hemiptera and Lepidoptera.

Approximately 10% of the Coleoptera collected at the three sites surveyed were Curculionidae, a percentage inferior to that obtained by Costa et al. (1992) who, on studying the entomofauna of the inflorescences of the palms *A. romanzoffianum* (queen palm) and *Butia capitata* (pindo palm), observed that 85% of the insects collected were of the order Coleoptera, of which 66.8% were of the family Curculionidae.

The most representative species of Curculionidae found in the survey were *Parisoschoenus obesulus* Casey, 1922 and *Parisoschoenus sanguinicollis* Hustache, 1949. *Palmocentrinus* sp. and *Palmoderes suturalis* Bondar, 1948 were present in smaller numbers. Insects of the tribe Derelonomini, and the genera *Celestes* sp., *Catolethrus* sp., *Hypocoeliodes* sp., and *Auletes* sp. were also observed. It must be pointed out that the species *P. obesulus* is considered a palm tree pest, as their larvae feed on the internal tissue of female flowers and new fruits, causing their death. In the state of São Paulo, their presence associated with palm trees was only confirmed in 2001 (Sanchez; Nakano, 2003).

The most frequent insects on the inflorescence of pejibaye palms in the Vale do Ribeira, SP, are of the orders Diptera, Coleoptera, and Hymenoptera. Moreover, microcurculionidae found on pejibayes palms in this region are likely to be a palm pest.

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