

PLANTS VISITED BY *Apis mellifera* L. (HYMENOPTERA: APIDAE) IN RECÔNCAVO BAIANO, STATE OF BAHIA, BRAZIL

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ABSTRACT

The objective of this study was to identify the plants visited by *Apis mellifera* L. (Hymenoptera: Apidae) in the region of Recôncavo Baiano, State of Bahia, Brazil. Flowering plants were assessed in a radius of 1.500 m around the apiaries visited. A total of 240 species belonging to 171 genera and 50 families were recorded. The family Leguminosae had the highest species richness (22%), followed by Asteraceae (14%) and Malvaceae (7%) of all plant species visited by *Apis mellifera*. The highest percentage of plants collected had herbaceous growth habit (44%), followed by woody plants (26%) and shrubs (18%). Lianas, vines and palm trees were significantly less represented. It was found that 65% of species had actinomorphic flowers and 33% had zygomorphic flowers. The genera that showed greater diversity were *Sida* with nine species, *Croton* with six species, *Senna* with five species. and while *Chamaecrista*, *Eucalyptus*, *Eupatorium*, *Ocimum*, *Passiflora* and *Vernonia* were represented by four species each. The flora of apicultural interest in the region of Recôncavo Baiano has a wide range of species with varying growth habits.

Keywords: Apicultural flora, bee, pollen, honey

PLANTAS VISITADAS POR *Apis mellifera* L. (HYMENOPTERA: APIDAE) NO RECÔNCAVO BAIANO**RESUMO**

O objetivo deste estudo foi identificar as plantas visitadas por *Apis mellifera* L. na região do Recôncavo Baiano. Foi realizado um levantamento das plantas em floração em um raio de 1.500 m dos apiários visitados. Foram registradas 240 espécies, pertencentes a 171 gêneros e 50 famílias. A família Leguminosae apresentou maior riqueza de espécies com 22%, seguida da Asteraceae (14%) e Malvaceae (7%) do total de espécies visitadas por *Apis mellifera*. A maior percentagem de

plantas coletadas apresentou hábito de crescimento herbáceo com 44%, seguido pelas de hábito arbóreo (26%) e arbustivo (18%). As lianas, trepadeiras e palmeiras tiveram menor representatividade. Verificou-se que 65% das espécies apresentaram flores actinomorfas e 33% zigomorfas. Os gêneros que apresentaram maior diversidade foram *Sida* com nove espécies, *Croton* com seis, *Senna* com cinco e *Chamaecrista*, *Eucalyptus*, *Eupatorium*, *Ocimum*, *Passiflora* e *Vernonia* representados por quatro espécies cada. A flora de interesse apícola na região do Recôncavo Baiano apresenta uma grande diversidade de espécies com hábitos de crescimento variado.

Palavras-chave: Flora apícola, abelha, pólen, mel

INTRODUCTION

Insects are important pollinators of angiosperms, and among them, the bees are considered the most efficient ones in almost all ecosystems. Approximately 67% of flowering plants depend on bees for pollination, while these depend directly on collecting pollen and nectar to feed their larvae and adults (VIANA & SILVA, 2006).

Africanized bees feed almost exclusively on pollen and nectar, needing to visit certain amounts of flowers daily. They can better adapt to tropical climates, managing to survive for several months, even when they have to face long periods of drought or rain, very common in these regions (MUNIZ & BRITO, 2007). The environmental value of apiculture is characterized by interdependence with the vegetation, since the visits of bees to flowers

of native species ensure agricultural pollination, increasing agricultural productivity and ensuring the perpetuation of native species (NOGUEIRA-NETO, 1998).

Melitophilous plants are those that provide products for bees (TORQUATO, 2006). According to Wiese (1987) the apicultural value of plants is related to the abundance of flowers, the daily volume of nectar secreted, with the concentration of sugars in nectar and low competition for pollinators.

The diversity of the Brazilian flora associated with the territorial extension and the existing climate variability, allows the country a great apicultural potential, with harvests during the entire year, what distinguishes Brazil from other producing countries that normally gather honey only once a year (MARCHINI et al., 2004). Little

is known about the floral resources needed to maintain communities of bees in natural habitats in Brazil (AGUIAR, 2003) and knowledge of plants that are food resources for bees is essential to the establishment of conservation programs for these insects (CARVALHO & MARCHINI, 1999). Through knowledge of plants used by bees in the pasture, beekeepers can handle their apiary in order to get a better use of flowers and thereby optimize their honey production (JONES & BRYANT JR., 1996).

The apicultural activity in Recôncavo Baiano is developed mainly by small and medium-sized farms, becoming an important source of income for many families in rural areas. Despite its importance, there are some limitations that hinder the increase of production honey and other bee products in this region, among which the low information are the regional apicultural flora. Thus, the objective of this study was to identify the plants visited by *Apis mellifera* L. (Hymenoptera: Apidae) in the Recôncavo Baiano region.

MATERIAL AND METHODS

Monthly collections of vegetative and reproductive parts of flowering plants visited by bees within 1.500 m of the apiaries were

conducted in the following six municipalities of Recôncavo Baiano: Cachoeira, Castro Alves, Cruz das Almas, Governador Mangabeira, Itatim and São Felix, in the period of March/2009 to February/2010.

The collection and processing of botanical material followed the techniques described by Moreti et al. (1989) and the material collected was deposited in the Herbarium of Recôncavo Baiano (HERB), Federal University of Recôncavo da Bahia. The pollen grains removed from the poliferous material (flower buds) were mounted on slides using the acetolysis method (ERDTMAN, 1960). The taxonomic identification of plant species was based on the available scientific literature and comparison with material deposited in the Herb collection.

The pollen slides were deposited in the pollen reference collection of Apiculture/Meliponiculture plants of the Núcleo de Estudo dos Insetos do Centro de Ciências Agrárias, Ambientais e Biológicas (Experimental Center for the Studies of Insects – Center of Agricultural, Environmental and Biological Sciences)/ Federal University of Recôncavo da Bahia. The characteristics of growth habit and floral

symmetry for each species were recorded according to Ferri (1983) and Bell (1991).

RESULTS AND DISCUSSION

A total of 240 plant species were visited by *Apis mellifera* in the municipalities of Recôncavo Baiano, distributed in 171 genera and 50 families (Table 1). The Leguminosae family had a higher richness of species (52) representing 22% of the total, followed by Asteraceae (14%) and Malvaceae (7%) (Figure 1).

The Asteraceae family stands out in many studies (POTT & POTT, 1986; RAMALHO et al., 1990; MARCHINI et al., 2001 and MELO, 2008) as one of the richest in species visited by bees. Locatelli & Machado (2001) suggest that this is probably due to the fact that this family is the largest and of greater geographical distribution one among angiosperms.

Melo (2008) recorded a total of 161 species of plants visited by *A. mellifera*, belonging to 117 genera and 46 families in the region of Mundo Novo, Bahia, and that the families Asteraceae, Leguminosae, Malvaceae, Myrtaceae, Sterculiaceae and Verbenaceae were the richest in species. These families were also more representative in this study (Figure 1).

The Leguminosae family, the most abundant in number of species in the studied region was reported by Viana et al. (2006) as one of the most important in terms of number of apicultural flora in an area of restinga in Bahia, with seven species recorded, indicating a likely apicultural potential for this region. The Leguminosae-Mimosoideae are composed of about 60 genera represented by 3,000 species, distributed mainly in tropical and subtropical regions, plus some species that are found in temperate regions. Its importance as a supplier of food source for bees is well known and is mentioned in several studies (ALMEIDA, 2002; ANDENA et al., 2002; CARVALHO et al., 2006 and NASCIMENTO et al., 2009a).

According to Ramalho et al. (1990) and Carvalho et al. (2001) the families Anacardiaceae, Arecaceae, Asteraceae, Balsaminaceae, Euphorbiaceae, Labiatae, Moraceae, Myrtaceae, Proteaceae, Rubiaceae and Sterculiaceae are important sources for the collection of trophic resources in the neotropical regions both for Africanized bees and stingless bees.

Table 1. List of species of apicultural interest collected at flowering within 1.500 m of apiaries in Recôncavo Baiano: March/2009 to February/2010. Legend: GH = Growth Habit, Herb = herbaceous, Arb = arboreous, Shr = shrubby, Li = Liana, Vine = vine, Pal = palm, FS = Flower Symmetry, Z = zygomorphic, A = actinomorphic, NR = not registered, RE = Resource, N = nectar, P = pollen, CA = Cruz das Almas, CC = Cachoeira, CT = Castro Alves, GM = Governador Mangabeira, IT = Itatim, SAF = São Felix.

| Family | Scientific Name | Common Name | GH | FS | RAE | Place of collection | Flowering Period |
|---------------|---|------------------------------|------|----|-----|---------------------|------------------------------|
| Acanthaceae | <i>Justicia</i> sp. | - | Shr | Z | P | CA | May to August |
| | <i>Ruellia paniculata</i> L. | - | Herb | Z | N/P | CT | Jan. and Sep. |
| Amaranthaceae | <i>Alternanthera brasiliana</i> (L.) Kuntze | Penicillin/sodium dipyrone | Herb | Z | N | CA | May |
| | <i>Alternanthera</i> sp. | - | Shr | Z | N | CA | April; July to Aug. |
| | <i>Alternanthera tenella</i> Colla | Perpétua do mato/ apaga-fogo | Herb | Z | N | CT | Aug. to Oct. |
| | <i>Amaranthus spinosus</i> L. | Thorny amaranth | Herb | Z | P | CA | Aug. |
| Anacardiaceae | <i>Anacardium occidentale</i> L. | Cashew | Arb | A | N | CA, CC, GM | Sep. |
| | <i>Astronium</i> cf. <i>macrocalyx</i> Engl. | - | Arb | A | - | CT | Oct. to Dec. |
| | <i>Astronium</i> sp. | Brazilian pepper | Arb | A | - | CA | March to May; Oct. to Dec. |
| | <i>Mangifera indica</i> L. | Mango | Arb | A | N | CC, CA, CT, GM | Sep. |
| | <i>Schinus terebinthifolius</i> Raddi | Brazilian pepper tree | Shr | A | N | CA, CC, GM | Feb. to May |
| | <i>Spondias tuberosa</i> Arr. Cam. | Umbu/Brazil plum | Arb | A | - | CA | Oct. |
| | <i>Spondias</i> sp. | Cajarana of the Hinterland | Arb | A | N | CA | Dec. |
| Apiaceae | <i>Coriandrum sativum</i> L. | Coriander | Herb | A | - | CA | Sep. to Dec. |
| | <i>Pimpinella anisum</i> L. | Anise | Herb | A | - | CA | June to Aug. |
| Apocynaceae | <i>Tabernaemontana laeta</i> Mart. | Jasmine | Arb | A | - | CC | Sep. |
| | <i>Thevetia thevetioides</i> (Kunth) K. Schum | Giant helvetia | Shr | A | - | CA | Nov. |
| Arecaceae | <i>Cocos nucifera</i> L. | Coconut | Pal | A | N | CA | Oct. to Jan.; April to July |
| | <i>Elaeis guineensis</i> Jacq. | Oil palm | Pal | A | P | CA | March to April; Sep. to Aug. |
| | <i>Syagrus coronata</i> Bond. | Licuri palm | Pal | A | N | CA | Oct. to Dec. |
| Asteraceae | <i>Acanthospermum australe</i> (Loefl.) Kuntze. | Paraguay Starbur | Herb | A | - | CA | Aug. to Sep. |
| | <i>Acanthospermum</i> sp. | Bristly Starbur | Herb | A | - | CA | Aug. to April. |
| | <i>Ageratum conyzoides</i> L. | Invading Ageratum | Herb | A | N | CA, SAF | Jan. to Dec. |
| | <i>Ageratum</i> sp. | Whiteweed | Herb | A | - | CC | Oct. |
| | <i>Aspilia</i> sp. | Daisy; Emilia plant | Herb | A | - | CA | July |
| | <i>Bidens pilosa</i> L. | Hairy beggarticks | Herb | A | N/P | CC, CA, CT, GM | May. to June |
| | <i>Bidens sulphurea</i> (Cav.) Sch. Bip. | Sulfur Cosmos; Yellow cosmos | Herb | A | N/P | CA | Jan. to Aug. |

(Continue...)

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Table 1. Continue...List of species of apicultural interest collected at flowering within 1.500 m of apiaries in Recôncavo Baiano: March/2009 to February/2010.

| Family | Scientific Name | Common Name | HC | SF | RE | Place of collection | Flowering Period | |
|------------|--|--|---------------------|-----|-----|---------------------|-----------------------------|--------------|
| Asteraceae | <i>Bidens</i> sp. | - | Herb | A | N | CA | Feb. to April; July to Sep. | |
| | <i>Blainvillea biaristata</i> DC. | - | Herb | A | - | CA | Aug. | |
| | <i>Blainvillea rhomboidea</i> Cass. | Erva-palha | Herb | A | - | CA | April to June | |
| | <i>CentratHerbum punctatum</i> Cass. | Brazilian button flower | Herb | A | N | CC, CA, CT, GM | May to Aug. | |
| | <i>Conyza canadensis</i> (L.) Cronquist. | Canadian horseweed | Herb | A | - | CA | March to June | |
| | <i>Eclipta alba</i> (L.) Hassk. | Elephant's foot | Herb | A | - | CA | Aug. | |
| | <i>Emilia sonchifolia</i> (L.) DC. | Lilac tassel-flower | Herb | A | - | CA | May to Aug. | |
| | <i>Erechtites hieracifolius</i> (L.) Raf. Ex DC. | Fireweed | NR | A | - | CA | Feb. to April; Sep. to Nov. | |
| | <i>Erechtites</i> sp. | Redflower ragleaf | Herb | A | N | CA | July | |
| | <i>Eupatorium maximilianii</i> Schrad. | - | Herb | A | - | CA | Aug. | |
| | <i>Eupatorium</i> sp.1 | - | Herb | A | - | CA | Aug. | |
| | <i>Eupatorium</i> sp.2 | False nettle | Herb | A | - | CC | Sep. | |
| | <i>Eupatorium</i> sp.3 | Little Joe | Herb | A | - | CC | Oct. | |
| | <i>Galinsoga parviflora</i> Cav. | Small-flower galinsoga | Herb | A | P | CA | May to July | |
| | <i>Helianthus annuus</i> L. | New sunflower | Herb | A | N/P | CA | Aug. to Jan. | |
| | <i>Melampodium paniculatum</i> Gardner | Butter daisy | Herb | A | - | CA | Aug. to Sep. | |
| | <i>Melampodium</i> sp.1 | - | Herb | A | - | CA | Aug. | |
| | <i>Melampodium</i> sp.2 | - | Herb | A | - | CC | Sep. | |
| | <i>Montanoa pyramidata</i> Sch.Bip. | Margarida-branca | Shr | A | - | CA | July to Oct. | |
| | <i>Piptocarpha</i> sp. | Ash daisy | Arb | A | - | CT | Dec. | |
| | <i>Pluchea sagittalis</i> (Lam.) | - | Herb | A | - | CA | Oct. | |
| | <i>Rudbeckia laciniata</i> L. | Cutleaf coneflower | Herb | A | - | CA | Oct. to Jan. | |
| | <i>Sonchus oleraceus</i> L. | - | Herb | A | - | CA | July | |
| | <i>Vernonia condensata</i> Baker. | Boldus | Shr | A | N | CA | June to Nov. | |
| | <i>Vernonia</i> sp.1 | Bitterleaf | Shr | A | N | CA | Oct.to March | |
| | <i>Vernonia</i> sp.2 | Bitterleaf | Shr | A | N | CA | Oct. to March | |
| | <i>Vernonia</i> sp.3 | - | Herb | A | N | CA | Aug. | |
| | Bignoniaceae | <i>Jacaranda</i> sp. | Brazilian rose wood | Arb | Z | - | CC | Oct. |
| | | <i>Spathodea campanulata</i> P. Beauv. | African Tuliptree | Arb | Z | P | CA, CC | Aug. to Nov. |
| | | <i>Stenolobium stans</i> (L.) Seem. | Yellow trumpetbush | Arb | Z | - | CA | Jan. to Dec. |

(Continue...)

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|------------------|---|---------------------------------|------|----|-----|---------------------|-----------------------------|
| | <i>Tabebuia</i> sp. | Brazilian walnut | Arb | Z | P | CA | May to Oct. |
| Bignoniaceae | <i>Tecoma heptaphylla</i> (Vell.) Mart. | Pink tecoma | Arb | Z | N | IT | May to July |
| Bixaceae | <i>Bixa orellana</i> L. | Annato | Arb | A | P | CA | Sep. to Nov. |
| Bombacaceae | <i>Pachira aquatica</i> Aubl. | Guaianan chestnut | Shr | A | - | CA | Dec. |
| Boraginaceae | <i>Cordia superba</i> Cham. | Baba-de-boi | Shr | A | - | CA; CT | Jan. |
| | <i>Cordia verbenacea</i> DC. | Forget-me-not | Shr | A | - | CA | Sep. |
| | <i>Heliotropium angiospermum</i> Murray | Scorpion's tail | Herb | A | N | CC, CA, CT, GM | March to June; Aug. to Oct. |
| | <i>Heliotropium</i> sp. | Heliotrope | Herb | A | N | CC, CA, | Aug. |
| Capparaceae | <i>Crataeva tapia</i> L. | Tapia | Arb | Z | - | CT | Jan.; Nov. |
| Caprifoliaceae | <i>Sambucus australis</i> Cham & Schlecht. | Black elder | Shr | A | P | CA | Sep. to April |
| Chrysobalanaceae | <i>Licania tomentosa</i> Benth. | Oiti tree | Arb | Z | - | CA | Oct. to Nov. |
| Combretaceae | <i>Terminalia catappa</i> L. | Bengal Almond | Arb | A | - | CA | Sep. |
| Commelinaceae | <i>Commelina benghalensis</i> L. | Bengal dayflower | Herb | Z | - | CA; CT | March to June; Aug. to Nov. |
| Convolvulaceae | <i>Ipomoea bahiensis</i> Willd. | - | Ter | Z | N | CA | Jan. to Dec. |
| | <i>Ipomoea carnea</i> Jacq. subsp. <i>fiatulosa</i> Mart. ex Choisy | Morning Glory bush | Shr | Z | N | CA | Jan. to Dec. |
| | <i>Ipomoea</i> sp. | Beach Morning Glory/Goat's foot | Li | Z | N | CC, CA, GM | Jan. to Dec. |
| | <i>Merremia aegyptia</i> (L.) Urb. | - | NR | NR | - | GM | Oct. |
| | <i>Merremia</i> sp. | - | NR | NR | - | CA | Aug. |
| Crassulaceae | <i>Bryophyllum pinnatum</i> (Lam.) Oken. | Horse chestnut | Herb | Z | - | CA | July to Dec. |
| Cucurbitaceae | <i>Cayaponia tayuya</i> (Vell.) Cogn. | Tayuya | Li | A | N | CA | Aug. |
| | <i>Momordica charantia</i> L. | Balsam pear | Li | A | N | CA; CT | July to Dec. |
| | <i>Sechium edule</i> Swartz. | Chayote | Li | A | N | CA | March to July |
| Euphorbiaceae | <i>Croton campestris</i> St. Hill. | Bellyache bush | Shr | A | N | CA; CT | Jan. to Feb.; May |
| | <i>Croton moritibensis</i> Baill. | Croton | Shr | A | N | CA; CT | Aug. to Dec. |
| | <i>Croton lobatus</i> L. | Croton | Herb | A | N | CA | May to Sep. |
| | <i>Croton</i> sp.1 | - | Herb | A | N | CA | May to Sep. |
| | <i>Croton</i> sp.2 | Croton | Herb | A | N/P | CA | March to June |
| | <i>Croton</i> sp.3 | Croton | NR | A | - | CA | Oct to Jan. |
| | <i>Euphorbia hyssopifolia</i> L. | Garden spurge | Herb | A | - | CA | April to July |
| | <i>Euphorbia milii</i> L. | Coroa-de-cristo | Shr | A | - | CA | May to Sep. |

(Continue...)

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|---------------------------------------|--|--------------------------------------|----------|-----|-----|---------------------|---------------------------------|
| Euphorbiaceae | <i>Jatropha molissima</i> (Pohl) Baill. | Black vomit nut | Shr | A | - | CT | March |
| | <i>Manihot esculenta</i> Crantz. | Brazilian arrowroot | Shr | A | N | CA | Aug. |
| | <i>Ricinus communis</i> L. | Castor bean | Shr | A | N/P | CA | Aug. to Dec. |
| Lamiaceae | <i>Hyptis multiflora</i> Pohl. | Bishop's wort | Herb | Z | N | CA | May to July |
| | <i>Ocimum basilicum</i> L. | Common Basil | Herb | Z | N | CA | Aug. to Dec. |
| | <i>Ocimum canum</i> Sims. | Sweet basil | Herb | Z | N | CT | May to June |
| | <i>Ocimum gratissimum</i> L. | Basil | Shr | Z | N | CA | Nov. |
| | <i>Ocimum</i> sp. | - | Herb | Z | N | CA | March to April |
| | <i>Salvia</i> sp.1 | - | Herb | Z | N | CA | July to Sep. |
| | <i>Salvia</i> sp.2 | Salvia | Herb | Z | N | CA | May. to April |
| Lauraceae | <i>Persea americana</i> Mill. | Avocado pear | Arb | A | - | CA | Sep |
| Leguminosae-Caesalpinioideae | <i>Bauhinia fortificta</i> Link. | Brazilian orchid tree | Arb | Z | P | CA | March to June; Sep. to Feb. |
| | <i>Caesalpinia ferrea</i> Mart. | Brazilian Iron wood | Arb | Z | N | IT | Jan. to March |
| | <i>Caesalpinia peltophoroides</i> Benth. | Sibipiruna | Arb | Z | P | CA | Jan. to March |
| | <i>Caesalpinia pyramidalis</i> Tul. | Lobelia wall | Arb | Z | P | CT | Jan. to April |
| | <i>Copaifera langsdorffii</i> Desf. | Jesuit's Balsam | Arb | Z | P | CT | Jan. to Feb. |
| | <i>Delonix regia</i> Raff. | Flamboyant | Arb | Z | P | CA | Nov. to Jan. |
| | <i>Poeppigia procera</i> C. Presl. | - | Arb | Z | N | IT | Aug. to Oct. |
| | <i>Senna macranthera</i> (Collad.) H.S.Irwin & Barneby | Java bean | Arb | Z | P | CC, CA, CT | Jan. to Feb.; May; July to Aug. |
| | <i>Senna obtusifolia</i> L. | Java bean | Shr | Z | P | CC, CA, GM | Aug. to Dec. |
| | <i>Senna occidentalis</i> L. | Stinking weed | Shr | Z | P | CC, CA, GM | March to April |
| | <i>Senna spectabilis</i> DC. | Bougainvillea Willd | Arb | Z | P | IT | Dec. to April |
| | <i>Senna</i> sp. | Cassia flowers | Shr | Z | P | CA | March to May; Oct. to Dec. |
| | <i>Tamarindus indica</i> L. | Tamarindo | Arb | Z | P | CC, CA, GM | Nov. to Jan. |
| | Leguminosae-Faboideae | <i>Bowdichia virgilioides</i> Kunth. | Sucupira | Arb | Z | P | CA; CT |
| <i>Cajanus cajan</i> L. | | Hybanthus | Herb | Z | P | CA | Sep. to Feb. |
| <i>Calliandra surinamensis</i> Benth. | | - | Arb | Z | - | CC | Sep. |
| <i>Canavalia ensiformis</i> DC. | | Jack bean | Herb | Z | - | CA | Sep. to Nov. |
| <i>Canavalia</i> sp. | | Candida | Herb | Z | - | CC | Sep. |
| <i>Chaetocalyx scandens</i> L. | | - | Ter | Z | N | IT | - |

(Continue...)

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|-------------------------------------|--|-------------------|------|----|-----|---------------------|----------------------------|
| Leguminosae-Faboideae | <i>Chamaecrista belemii</i> (H.S.Irwin & Barneby) | - | Herb | Z | P | IT | - |
| | H.S.Irwin & Barneby | - | Herb | Z | P | CA | May to July |
| | <i>Chamaecrista flexuosa</i> (L.) Greene | - | Herb | Z | P | CA | May to July |
| | <i>Chamaecrista rotundifolia</i> (Pers.) Greene | - | Herb | Z | P | CA | Aug. to Dec. |
| | <i>Chamaecrista</i> sp. | - | Herb | Z | P | CA | Nov. |
| | <i>Clitoria fairchildiana</i> Howard. | Sombrero | Herb | Z | P | CA, GM | Feb. to May |
| | <i>Crotalaria incana</i> L. | Rattlepod | Herb | Z | P | CC, CA, GM | Aug. to Jan. |
| | <i>Desmodium adscendens</i> (Sw.) DC. | Desmodium | Herb | Z | - | CA | March to Nov. |
| | <i>Desmodium</i> sp. | Desmodium | Herb | Z | P | CT | Jan.; April; July |
| | <i>Desmodium triflorum</i> (L.) DC. | Desmodium | Herb | Z | P | CT | Nov. to Dec. |
| | <i>Erythrina velutina</i> Willd. | Woodson | Herb | Z | N | CA | Aug. to Sep. |
| | <i>Gliricidia sepium</i> Jacq. | Quick-stick | Herb | Z | P | CA | May to July |
| | <i>Indigofera hirsuta</i> L. | Hairy indigo | Herb | Z | P | CA | Aug. |
| | <i>Lablab purpureus</i> (L.) Sweet. | Hyacinth bean | Herb | Z | P | CA | Jan.; Nov. to Dec. |
| | <i>Lonchocarpus cultratus</i> (Vell.) A.M.G. Azevedo & H.C. Lima | Lonchocarpus | Arb | Z | P | CT | Aug. to Nov. |
| | <i>Macroptilium</i> sp.1 | Willow | Li | Z | P | CA | May to July |
| | <i>Macroptilium</i> sp.2 | - | Herb | Z | P | CA | Nov. |
| | <i>Peltophorum dubium</i> (Spreng) Taub. | Snake cactus | Arb | Z | P | CA | April to May; Sep. to Oct. |
| | <i>Phaseolus vulgaris</i> L. | Phellodendron | Herb | Z | - | CA | Aug. |
| | <i>Stylosanthes viscosa</i> Sw. | Poor man's friend | Herb | Z | P | CA | July |
| <i>Vigna unguiculata</i> (L.) Walp. | Cylindrica | Herb | Z | P | CA | May to Sep. | |
| <i>Zornia diphylla</i> Pers. | - | Herb | Z | P | CA | Jan. to Feb. | |
| Leguminosae-Mimosoideae | <i>Acacia bahiensis</i> Benth. | Cat's claw | Shr | A | - | CT | Jan.; Sep. to Oct. |
| | <i>Acacia langsdorfii</i> Benth. | Cat's claw | Shr | A | - | CT | Feb. |
| | <i>Acacia</i> sp. | Calumbi | Arb | A | N/P | CA | Dec. |
| | <i>Albizia polycephala</i> (Benth.) Killip | Angico-branco | Arb | A | - | CT | Jan. |
| | <i>AnadenanHerba colubrina</i> (Vell.) Brenan | Angico | Arb | A | - | CA; CT | Nov. |
| | <i>Inga bahiensis</i> Benth. | Ingá | Arb | A | - | CA; CT | Aug. to Dec. |
| | <i>Inga edulis</i> Mart. | Ingá-cipó | Arb | A | - | CA | Sep. to Dec. |
| | <i>Leucaena leucocephala</i> Lam. | Leucena | Arb | A | N/P | CA | Aug. to Oct. |
| | <i>Mimosa arenosa</i> (Willd.) Poir. | Jurema | Arb | A | N/P | CC, CA; CT | |

(Continue...)

PLANTS VISITED BY *Apis mellifera* L. (HYMENOPTERA: APIDAE) IN RECÔNCAVO BAIANO, STATE OF BAHIA, BRAZIL

Table 1. Continue...List of species of apicultural interest collected at flowering within 1.500 m of apiaries in Recôncavo Baiano: March/2009 to February/2010.

| Family | Scientific Name | Common Name | HC | FS | RE | Place of Collection | Flowering Period |
|-------------------------|--|------------------------|-------|------|-----|---------------------|--------------------------------|
| Leguminosae-Mimosoideae | <i>Mimosa caesalpiniaefolia</i> Benth. | Thrus | Arb | A | - | CC, CA | June to Sep. |
| | <i>Mimosa pudica</i> L. | Malícia | Herb | A | N/P | CC, CA | April to July and Aug. to Nov. |
| | <i>Prosopis juliflora</i> DC. | Mesquite | Arb | A | - | CA; CT | Oct. to Dec. |
| Liliaceae | <i>Bulbine frutescens</i> L. | Snake flower | Herb | A | - | CA | May to Aug. |
| Loranthaceae | <i>Struthanthus</i> sp. | Mistletoe | Li | A | - | CA | Sep. to Nov. |
| Lythraceae | <i>Cuphea racemosa</i> (L.f.) Spreng. | - | Herb | Z | - | CT | April to June |
| Malpighiaceae | <i>Byrsonima</i> sp. | Golden spoon | Shr | Z | - | CA | Dec. |
| | <i>Malphigia emarginata</i> DC. | Acerola | Shr | Z | - | CA | Sep. to Nov. |
| | <i>Stigmaphyllon auriculatum</i> (Cav.) Adr. Juss. | - | Ter | Z | P | IT | Dec. to Feb. |
| Malvaceae | <i>Gossypium hirsutum</i> L. | Cotton | Herb | A | P | CA | Oct. to Jan. |
| | <i>Herissantia crispa</i> (L.) Fryxell | Bladdermallow | Herb | A | - | CT | March; June; Aug. to Oct. |
| | <i>Hibiscus esculentus</i> L. | Ókra | Herb | A | P | CA | Dec. to Feb. |
| | <i>Hibiscus rosa-sinensis</i> L. | Graxa | Shr | A | N/P | CA, CC | Jan. to Dec. |
| | <i>Hibiscus</i> sp. | Hibiscus | Shr | A | P | CA | April to Aug. |
| | <i>Malvastrum tomentosum</i> (L.) S.R. Hill | - | Herb | A | - | CT | Aug. |
| | <i>Pavonia cancellata</i> Cav. | Arrow leaf sida | Herb | A | - | CA | Jan. to Dec. |
| | <i>Sida cordifolia</i> L. | Arrow leaf sida | Herb | A | P | CA | Jan. to Dec. |
| | <i>Sida linifolia</i> Juss ex Card. | Arrow leaf sida | Herb | A | P | CA | Aug. to Dec. |
| | <i>Sida paniculata</i> L. | Arrow leaf sida | Herb | A | P | CT | Jan.; Aug. to Sep. |
| | <i>Sida rhombifolia</i> L. | Arrow leaf sida | Herb | A | P | CA | March to June |
| | <i>Sida spinosa</i> L. | Ivy-leaf Sida | Herb | A | P | CA | July to Aug.; Oct. to Nov. |
| | <i>Sida</i> sp.1 | Ivy-leaf Sida | Herb | A | P | CA | Aug. to Dec. |
| | <i>Sida</i> sp.2 | Ivy-leaf Sida | Herb | A | P | CA | Aug. to Dec. |
| | <i>Sida</i> sp.3 | Malv Ivy-leaf Sida | Herb | A | P | CA | March to May and Aug. to Nov. |
| | <i>Sida</i> sp.4 | Ivy-leaf Sida | Herb | A | - | CA | Jan. to Dec. |
| | Meliaceae | <i>Urena lobata</i> L. | Urens | Herb | A | - | CA |
| Meliaceae | <i>Trichilia hirta</i> L. | Erytroxilum | Arb | A | - | CT | Jan. |
| Molluginaceae | <i>Mollugo verticillata</i> L. | - | Herb | A | - | CA | May |
| Moringaceae | <i>Moringa oleifera</i> Lam. | Horseradish tree | Shr | A | N/P | CA | Jan. a dez. |
| Myrtaceae | <i>Eucalyptus</i> sp.1 | Eucalyptus | Arb | A | N/P | CA | Nov. to Dec.; Jan. to March |
| | <i>Eucalyptus</i> sp.2 | Eucalyptus | Arb | A | N/P | CA | Nov. to Dec.; Jan. to March |

(Continue...)

Table 1. Continue...List of species of apicultural interest collected at flowering within 1.500 m of apiaries in Recôncavo Baiano: March/2009 to February/2010.

| Family | Scientific Name | Common Name | HC | FS | RE | Place of collection | Flowering Period |
|----------------|---|------------------------|------|----|-----|---------------------|-------------------------------|
| Myrtaceae | <i>Eucalyptus</i> sp.3 | Eucalyptus | Arb | A | N/P | CA | Nov. to Dec.; Jan. to March |
| | <i>Eucalyptus torelliana</i> F.Muell. | Eucalyptus | Arb | A | N/P | CA | Nov. to Dec.; Jan. to March |
| | <i>Eugenia uniflora</i> L. | Brazilian cherry | Arb | A | P | CA | Aug. to Oct. |
| | <i>Myrciaria cauliflora</i> Berg. | Brazilian grape tree | Shr | A | - | CA | Sep. to Nov. |
| | <i>Psidium araça</i> Raddi. | Arnica | Shr | A | N/P | CA | March to April |
| | <i>Psidium guajava</i> L. | Guave | Arb | A | - | CA | Sep. |
| | <i>Syzygium cumini</i> (L.) Skeels | Cumini | Arb | A | - | CA | Jan. to Feb. |
| | <i>Syzygium malaccensis</i> L. | Malay apple | Arb | A | N/P | CA | Nov. to Dec. |
| Onagraceae | <i>Ludwigia</i> sp. | - | Herb | A | N | CA | April to May; Dec. to Jan. |
| Oxalidaceae | <i>Averrhoa carambola</i> L. | Star fruit | Arb | A | - | CA | Nov. |
| Oxalidaceae | <i>Oxalis psoraleoides</i> H.B.K. | - | Shr | A | - | CT | Jan. to Feb.; May |
| Papaveraceae | <i>Argemone mexicana</i> L. | Prickly poppy | Herb | A | - | CA | Aug. |
| Passifloraceae | <i>Passiflora edulis</i> L. | Passion fruit | Ter | A | - | CA | Oct. |
| | <i>Passiflora foetida</i> L. | Passion fruit | Ter | A | N | IT | Oct. |
| | <i>Passiflora macrocarpa</i> Mart. | Passion fruit | Ter | A | - | CA | Nov. |
| | <i>Passiflora violacea</i> Vell. | Passion fruit vine | Ter | A | N | IT | Oct. |
| Poaceae | <i>Sorghum bicolor</i> L. | Great millet | Herb | NR | P | CA | Oct. |
| | <i>Zea mays</i> L. | Corn | Herb | NR | P | CC, CA, GM | Aug. |
| Polygonaceae | <i>Antigonon leptopus</i> Hook. | Coral creeper | Ter | A | - | CA | Jan. to Dec. |
| | <i>Coccoloba paniculata</i> Meisn. | Arborecens | Shr | A | - | CC | Sep. |
| | <i>Ruprechtia laxiflora</i> Meisn. | - | Arb | A | - | CT | Dec.; Jan. to Feb. |
| Portulacaceae | <i>Portulaca elatior</i> Mart. | - | Herb | A | - | CT | Jan. to June.; Aug. to Oct. |
| | <i>Portulaca oleracea</i> L. | Garden purslane | Herb | A | P | CC, CA, GM | Sep to Nov. and March to June |
| | <i>Portulaca</i> sp. | - | Herb | A | N | CA | Marc to June |
| | <i>Talinum patens</i> Will. | Gaertner | Herb | A | - | CC, CA; CT | March to May and Aug. to Nov |
| Rhamnaceae | <i>Ziziphus joazeiro</i> Mart. | Ziziphus jujuba Miller | Arb | A | N | CT | Dec.; Jan. to Feb. |
| Rubiaceae | <i>Borreria suaveolens</i> G. Mey | Suaveolens Var | Herb | A | N | CA | May to Oct. |
| | <i>Borreria verticillata</i> (L.) G. Mey. | Ambrosioides | Herb | A | N/P | CA, CC, SAF, GM | May to Aug. |
| | <i>Borreria</i> sp. | - | Herb | A | N/P | CA | May |
| | <i>Emmeorhiza umbellata</i> (Spreng.) K. Schum. | - | Li | A | - | CC | Sep. |
| | <i>Genipa americana</i> L. | Genipa tree | Arb | A | N | CA | March to May |

(Continue...)

PLANTS VISITED BY *Apis mellifera* L. (HYMENOPTERA: APIDAE) IN RECÔNCAVO BAIANO, STATE OF BAHIA, BRAZIL

Table 1. Continue...List of species of apicultural interest collected at flowering within 1.500 m of apiaries in Recôncavo Baiano: March/2009 to February/2010.

| Family | Scientific Name | Common Name | HC | FS | RE | Place of collection | Flowering Period |
|------------------|--|---------------------------|------|----|-----|---------------------|-------------------------------|
| Rubiaceae | <i>Machonia spinosa</i> Mart. | - | NR | A | N | CT | March |
| | <i>Richardia grandiflora</i> (Cham. & Schltld.) | Ervanço | Herb | A | N | CA | May to Aug. |
| | <i>Richardia</i> sp. | - | Herb | A | N | CA | Jan. to Dec. |
| Rutaceae | <i>Citrus latifolia</i> Tan. | Lemon/Tahiti lime | Shr | A | N | CA | March to April; Aug to Oct. |
| | <i>Citrus limonia</i> Osbeck | Rangpur Lime | Arb | A | N | CA | Sep. |
| | <i>Citrus sinensis</i> (L.) Osbeck | Orange tree | Shr | A | N | CA,CC, GM | March to April.; Aug. to Oct. |
| Sapindaceae | <i>Cardiospermum corindum</i> L. | Baloon vine | Li | A | N | CA; CT; IT | July to Sep. |
| | <i>Serjania pernambucensis</i> Radlk. | Cipo-uva | Ter | A | N | CA | July to Sep. |
| Sapotaceae | <i>Bumelia sartorum</i> Mart. | Quixabeira | Arb | A | N | CT | Sep. |
| | <i>Manilkara acharas</i> Mill (Flosberg) L. | Sapodilla tree | Arb | A | N | CA | Aug. to Oct. |
| Scrophulariaceae | <i>Scoparia dulcis</i> L. | Sweet broom | Herb | Z | N/P | CA | Aug. to Sep.; March to June |
| Solanaceae | <i>Cestrum laevigatum</i> Schltld. | Quarana | Shr | A | P | CA | Nov. |
| | <i>Nicotiana tabacum</i> L. | Tobacco | Herb | A | P | CA | Aug. to Nov. |
| | <i>Physalis pubescens</i> L. | Downy ground-cherry | Herb | A | P | CA | Aug. |
| | <i>Physalis</i> sp. | - | Herb | A | P | CA | July |
| | <i>Solanum americanum</i> Mill. | American Black Nightshade | Herb | A | P | CA | July |
| Sterculiaceae | <i>Melochia tomentosa</i> L. | - | Shr | A | N | CT; IT | Jan. to June; Aug. to Dec. |
| | <i>Waltheria indica</i> L. | - | Herb | A | N | CT | Aug. |
| | <i>Waltheria</i> sp. | - | Herb | A | N | CA | Nov. to Feb. |
| Turneraceae | <i>Piriqueta racemosa</i> (Jacq.) Swert | - | Herb | A | - | CT | Aug.; Oct. |
| | <i>Turnera ulmifolia</i> L. | - | Herb | A | - | CA | Aug. to Sep.; Jan. |
| | <i>Turnera</i> sp. | - | Herb | A | N/P | CT | Aug. to Sep.; Jan. |
| Verbenaceae | <i>Aloysia gratissima</i> (Gillies & Hook.) Tronc. | White bush | Shr | Z | N | CA | Aug. to Jan. |
| | <i>Aloysia virgata</i> (Ruiz & Pav.) Juss. | Pippia | Arb | Z | N | CA | Oct. to Nov. |
| | <i>Duranta repens</i> L. | Pingo-de-ouro | Shr | Z | - | CA, GM | May to July |
| | <i>Gmelina</i> sp. | Teca | Arb | Z | - | CA | March |
| | <i>Lantana camara</i> L. | Wild sage | Shr | Z | N | CA | Jan. to Dec. |
| | <i>Lippia alba</i> N.E. Brown. | Lemongrass | Shr | Z | N | CA; CT | Aug. to Jan. |
| | <i>Lippia</i> sp. | Lippia | NR | Z | N | CA | - |
| Verbenaceae | <i>Priva bahiensis</i> DC. | - | Herb | Z | - | SAF | - |
| Vitaceae | <i>Cissus simsiana</i> Roem. & Schult. | Cissus | Li | A | N | CT | Jan. to Feb. |

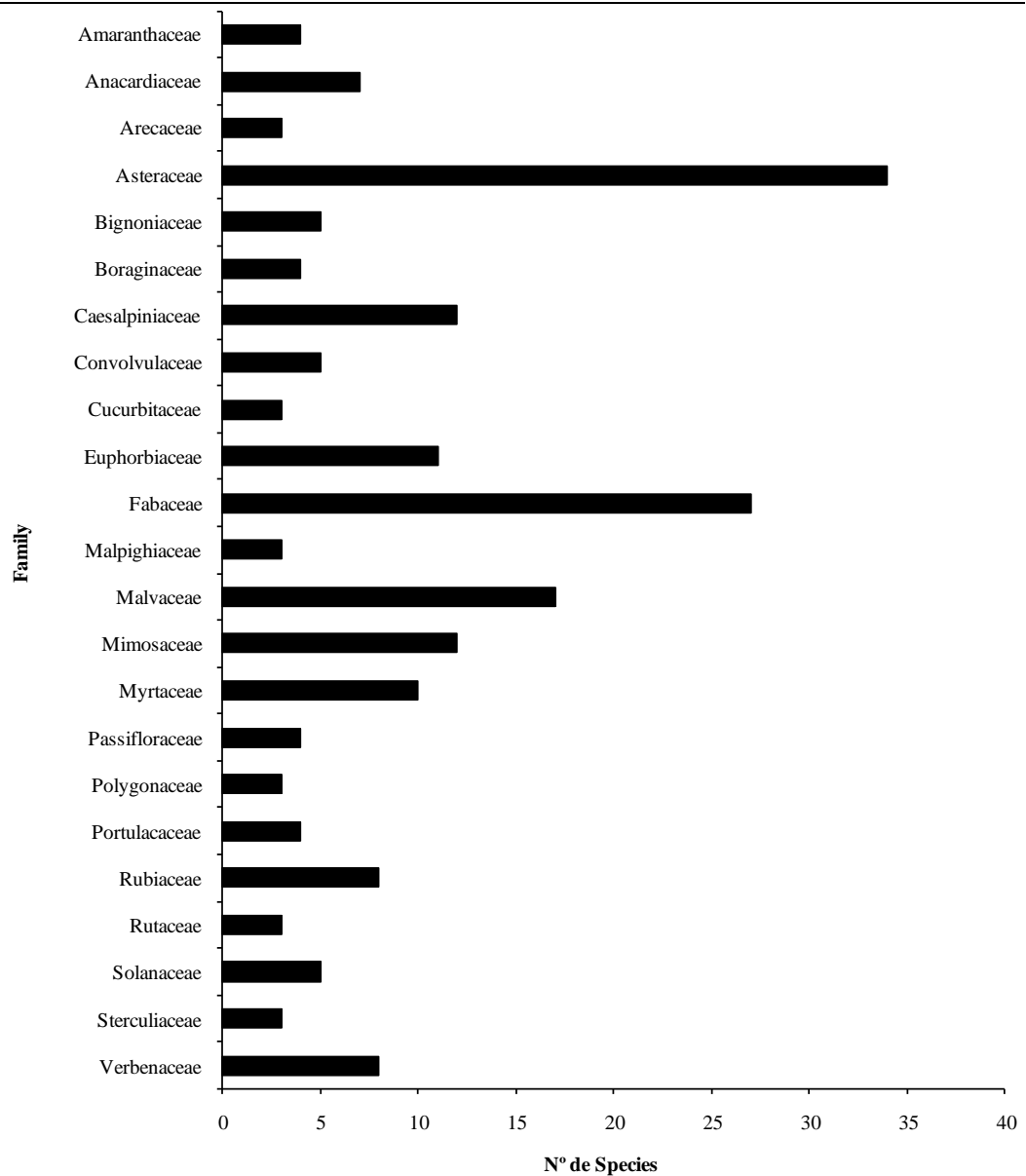


Figure 1. Main families in number of species of apicultural interest collected at flowering plants within 1.500 m of apiaries in Recôncavo Baiano: March/2009 to February/2010.

Aguiar et al. (1995) when evaluating the floral resources used by bees in the caatinga area found that the families Boraginaceae, Convolvulaceae, Cactaceae, Sterculiaceae and Caesalpinaceae represent the largest source of pollen and nectar in the area. According to these authors the floral resources are related to seasonal variation and the flowering pattern of

plants exerts a strong influence on the community structure of bees.

For the Myrtaceae family, pollen is the main resource offered to the pollinators, being the primary resource through which the bees, probably the most important group of pollinators of this family, visit the flowers (NIC LUGHADHA & PROENÇA, 1996).

There are very few evidence of nectar production observed in *Myrciaria dubia* (PETERS & VASQUEZ (1986, 1987), MAUÉS & COUTURIER (2002), *Psidium guajava* and *Eugenia* spp. (RAMALHO et al., 1990), *Myrciaria cauliflora* (MALERBO et al., 1991) and *Plinia glomerata* (PIRANI & CORTOPASSI-LAURINO, 1993). This family was represented by 10 species in this study with emphasis on the *Eucalyptus* genus with 4 species (Table 1 and Figure 1). Some *Eucalyptus* species are cited by Nogueira-Neto (1953, 2009) as species producing good quality honey.

Among the plants of the family Verbenaceae, *Aloysia virgata* is considered by Brandão et al. (2002) as a species of great importance to apiculture. It is found in Bahia, Mato Grosso do Sul and in the Southeast (LORENZ, 2002). This species, which was collected in the city of Cruz das Almas, Bahia, can be used by beekeepers in the area around the apiary to produce honey.

The genera with the highest diversity were *Sida* with 9 species, *Croton* (6), *Senna* (5) and *Chamaecrista*, *Eucalyptus*, *Eupatorium*, *Ocimum*, *Passiflora* and *Vernonia* with four species each (Table 1).

From the species collected in this study, 64 were already registered as constituents of apicultural flora in different localities of Bahia

in studies conducted by Moreti et al. (2000); Sodre et al. (2001); Costa (2002); Almeida et al. (2006); Melo (2008); Novais et al. (2009) and Oliveira et al. (2010).

The highest percentage of plants that were identified had an herbaceous growth habit (44%), followed by a woody habit (26%) and shrubs (18%). Lianas (4%), vines (4%) and palms (1%) were significantly less represented. Most of the bees visiting the flowers of herbaceous plants can be associated to the abundance of these plants in the region, the flowering period with a higher concentration of species between March and June during the rainy season in the region (Table 1), the shape and color of flowers (more attractive to bees) and even the concentration of nectar and pollen quantity offered by them. According to Oliveira et al. (2009) bees show a preference for woody plants in general and the resources to be used by the bees depend on their availability in the collection area. Rain promotes diversification of resources due to the low flowering.

Alves (2008), working with the characterization of apicultural flora of the upper Rio Paraná, found that the growth habit of the species was varied and reasonably well distributed, and the tree species and shrubs both represented 19.70% of the plants collected and the other subshrubs 26.52%, 12.88%

herbaceous and 21.21% vines; results somewhat no similar to those found in this study.

It was found that 65% of species had actinomorphic flowers and 33% zygomorphic flowers, while 2% of the species did not have their floral symmetry determined during the period to data collecting. Alves (2008) reported in his study that the most common pattern in relation to floral symmetry was actinomorphic flowers arranged in inflorescences and with a light color corollas. *Apis mellifera* prefer actinomorphic flowers (DAFNI, 1992).

Some fruit species (8%) of apicultural interest to the region were observed, such as *Anacardium occidentale* L., *Byrsonima* sp., *Citrus latifolia* Tan., *C. limonia* Osbeck, *C. sinensis* (L.) Osbeck, *Eugenia uniflora* L., *Malpighia emarginata*, *Mangifera indica* L., *Manilkara acharas* Mill (Flosberg) L., *Myrciaria cauliflora* Berg., *Passiflora edulis*, *P. foetida* L., *P. macrocarpa* Mart., *Persea americana* Mill., *Psidium araca* Raddi., *P. guajava* L., *Spondias tuberosa* Arr. Cam., *Spondias* sp., *Syzygium cumini* (L.) Skeels and *Tamarindus indica* L. (Table 1). In addition to using cultivated native fruit plants, many bees also visit flowers of ornamental plants, like *Thunbergia grandiflora* Roxb., *Asystasia gangetica* (L.) T. Anderson and *Tecoma stans*

(L.) Kunth (MILET-PINHEIRO & SCHLINDWEIN, 2008).

According to Santos et al. (2006) among the species preferentially visited by *Apis mellifera* in Petrolina, State of Pernambuco, the herbaceous species, such as *Borreria verticillata* (L.) G. Mey., *Diodia teres* Walter., *Waltheria rotundifolia* Schrank, *Merremia aegyptia* L., *Jacquemontia confusa* Meisn., and *Hypenia salzmanni* Benth stood out as excellent suppliers of nectar during the rainy season. Some of these species appear in the list of plants collected in this study and the species *Borreria verticillata* is among the pollen types identified in honeys and the mass of pollen collected by Africanized honeybees in Bahia (COSTA, 2002; NASCIMENTO et al., 2009b).

Carvalho & Marchini (1999), in a study on plants visited by *Apis mellifera* in Castro Alves, Bahia, also found the occurrence of several herbaceous species such as *Commelina benghalensis* L., *Croton campestris* St. Hil., *Centratherum punctatum* Cass., *Momordica charantia* L., *Sida paniculata* L., *Portulaca* spp. and *Waltheria indica* L., and although they bloom during the rainy season and despite being considered weeds to crops, they present an apicultural potential. These species were also collected in the region studied and the

record of flowering ones (Table 1) corroborates with those of the authors.

CONCLUSION

Flora visited by *Apis mellifera* L. in the Recôncavo Baiano region has a high diversity of species, especially from the family Leguminosae.

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