Revista Macambira
ISSN:2594-4754
Macambira Journal
Laboratory of Public Policies, Ruralities and Territorial Development (LaPPRuDes)
ARTICLE
https://doi.org/10.35642/rm.v5i2.569

Macambiras and sympatric species of Serra do Jatobá, Milagres, Bahia, Brazil

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Abstract: Macambira is popularly designated to two species of Bromeliaceae: *Bromelia laciniosa* and *Encholirium spectabile*. Both species are xerophilous and have morphological and physiological structures adapted to the semiarid climate. Floristic studies are essential for the knowledge of existing species in certain areas and provide information on diversity, distribution, life forms, and conservation. Sympatry is defined as when two or more populations overlap without crossings between individuals of different species in the same geographical distribution. In this way, the objective of this study was to present the species that occur in sympatry with the macambiras in Serra do Jatobá, municipality of Milagres, Bahia, Brazil. Thirty-seven species belonging to three subfamilies were observed living in sympatry with the macambiras: Bromelioideae (19 spp.), Tillandsioideae (16 spp.), and Pitcairnioideae (2 spp.). The most representative genera of Bromelioideae were *Tillandsia* (13 spp.) and *Hohenbergia* (4 spp.). The genera *Alcantarea*, *Bromelia*, *Cryptanthus*, *Dyckia*, *Encholirium*, *Karawata,* and *Neoglaziovia,* presented only one species each. From the observed species, 70.26% are endemic to Brazil. From these, 32.4% occur exclusively in Bahia. About the status conservation, the species *Aechmea disjuncta* and *Tillandsia milagrensis* are considered 'Endangered', and *Alcantarea nahoumii* and *Orthophytum rubrum* are considered 'Vulnerable'. The results presented can support conservation studies of these species and, in the future, support the creation of a conservation unit in the inselbergs of Bahia because these environments are maintainers of biodiversity and work as an "oasis" of the Caatinga.

Keywords: *Bromelia laciniosa*, Bromeliaceae, *Encholirium spectabile,* Floristic studies, Caatinga.

MACAMBIRA JOURNAL
Federal Institute of Education, Science and Technology Baiano, c*ampus* Serrinha. Estrada Vicinal de Aparecida, s/n, Bairro Aparecida, Serrinha, Bahia, Brasil, CEP: 48700-000, sala 01, prédio acadêmico.

Revista Macambira
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Macambiras e espécies simpátricas da Serra do Jatobá, Milagres, Bahia, Brasil

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Resumo: A macambira é popularmente designada a duas espécies de Bromeliaceae: *Bromelia laciniosa* e *Encholirium spectabile*. Ambas as espécies são xerófilas e possuem estruturas morfológicas e fisiológicas adaptadas ao clima semiárido. Estudos florísticos são importantes para o conhecimento das espécies existentes em determinadas áreas e fornecem informações sobre a diversidade, distribuição, formas de vida e conservação. A simpatria é definida quando duas ou mais populações se superpõe sem que ocorram cruzamentos entre indivíduos das diferentes espécies em uma mesma distribuição geográfica. Diante do exposto, o objetivo do trabalho foi apresentar as espécies que ocorrem em simpatria com as macambiras na Serra do Jatobá, município de Milagres, Bahia, Brasil. Foram observadas vivendo em simpatria com as macambiras, 37 espécies pertencentes a três subfamílias: Bromelioideae (19 spp.), Tillandsioideae (16 spp.) e Pitcairnioideae (2 spp.). Os gêneros mais representativos de Bromelioideae foram *Tillandsia* (13 spp.) e *Hohenbergia* (4 spp.). Os gêneros *Alcantarea*, *Bromelia*, *Cryptanthus*, *Dyckia*, *Encholirium*, *Karawata* e *Neoglaziovia* apresentaram apenas uma espécie cada. Das espécies observadas, 70,26% são endêmicas do Brasil. Destas, 32,4% ocorrem exclusivamente na Bahia. Quanto ao nível de ameaça, as espécies *Aechmea disjuncta* e *Tillandsia milagrensis* são consideradas 'Em Perigo' e *Alcantarea nahoumii* e *Orthophytum rubrum* são consideradas 'Vulneráveis'. Os resultados apresentados podem subsidiar estudos de conservação dessas espécies e, futuramente, apoiar a criação de uma unidade de conservação nos inselbergs da Bahia, pois esses ambientes são mantenedores da biodiversidade e funcionam como "oásis" da Caatinga.

Palavras-chave: *Bromelia laciniosa*, Bromeliaceae, *Encholirium spectabile,* Estudos florísticos, Caatinga.

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Introduction

Brazil has the highest diversity of Bromeliaceae, with approximately 1,379 species and 56 genera, representing about 40% of species and 80% of genera (FORZZA et al., 2020). The state of Bahia has 357 species distributed in 33 genera and are found in the three phytogeographic domains of the state: Atlantic Forest, Caatinga and Cerrado (FORZZA et al., 2020).

Floristic studies are essential for the knowledge of existing species in certain areas, providing data on diversity, distribution, life forms, and conservation (ZORZANELLI et al., 2017). For Bromeliaceae, this type of study was concentrated in Atlantic Forest Areas and Brazil's south and southeast regions (WANDERLEY; MOLLO, 1992; WANDERLEY; FORZZA, 2003; VERSIEUX; WENDT, 2006; MOURA et al., 2007; WANDERLEY; MARTINS, 2007).

In the South Brazil, we can highlight the work of Reitz (1983) "Bromeliáceas e a Malária-Bromélia Endêmica/ Flora Ilustrada Catarinense" and Bonnet and Queiroz (2006) studying the vertical stratification of epiphytic bromeliads in different successional stages of the dense ombrófila forest on the Island of Santa Catarina, besides the works of Waechter (1986; 1992; 1998), Aguiar et al. (1981), Rogalski and Zanin (2003), Giongo and Waechter (2004) for Rio Grande do Sul and Dittrich et al. (1999), Kersten and Silva (2001; 2002), Borgo and Silva (2003) and Kremer (2011) for Paraná.

The Southeastern region is one of the most studied, with the state of São Paulo presenting a significant work, the "Flora Fanerogâmica do Estado de São Paulo" (WANDERLEY; MARTINS, 2007). Other important works were the "Flora Fanerogâmica da Ilha do Cardoso" (WANDERLEY; MOLLO, 1992) and the "Flora Fanerogâmica do Parque Estadual das Fontes do Ipiranga" (WANDERLEY; MOREIRA, 2000), besides Pinto et al. (1995) and Dislich and Mantovani (1998). The state of Rio de Janeiro has numerous publications, one of them "Bromeliaceae das Restingas Fluminenses: Florística e Fitogeografia" (MOURA et al., 2007). Costa and Wendt (2007) published "Bromeliaceae na Região de Macaé de Cima, Nova Friburgo, Rio de Janeiro", which is an area with high diversity and endemism. In Minas Gerais, several publications covering the family are cited, such as the *"Checklist* de Minas Gerais" (VERSIEUX; WENDT, 2006), the "Vegetação de campos rupestres" (CONFFANI-NUNES, 1997), the "Flora da Serra do Cipó, Minas Gerais - Bromeliaceae: Pitcairnioideae" (FORZZA; WANDERLEY, 1998), the "Flora de Grão-Mogol, Minas Gerais: Bromeliaceae" (WANDERLEY; FORZZA, 2003), "Bromelioideae (Bromeliaceae) in Serra do Cipó, Minas Gerais" (SANTOS, 2009), among others.

Concerning the Northeast region, we can mention some studies such as "Flora do Pico das Almas" (MAYO et al., 1995), "Lista das plantas vasculares de Catolés" (FORZZA; WANDERLEY, 2003), "Flora da Paraíba" with emphasis on the genus *Tillandsia* (PONTES; AGRA, 2006), the "Flora de Sergipe" (SOUZA; WANDERLEY, 2015) and "Bromeliaceae no estado do Rio Grande do Norte" (TOMAZ; VERSIEUX, 2019).

In turn, among the floristic surveys that inventoried Bromeliaceae in the Caatinga, the works of France et al. (1997), Wanderley and Souza (2002); Silva et al. (2006); Oliveira et al. (2015); Castro et al. (2016); and Carvalho et al. (2020). These works are related to the epiphytism of the species, mainly with the Licuri Trees (*Syagrus coronata* (Mart.) Becc.), highlighting the importance of this phorophyte as a nurse plant in the Caatinga.

Among the species of Bromeliaceae, it is worth mentioning two emblematic species of the Caatinga, *Bromelia laciniosa* Mart. ex Schult.f. and *Encholirium spectabile* Mart. ex Schult. & Schult.f., popularly known as macambira. Both are xerophilous and have morphological and physiological structures adapted to the semi-arid climate. Both species have several potentialities of use, ranging from ecological importance to use as ornamental plants, live fences, animal and human food, medicinal properties and pharmacological activities, raw material for the manufacture of handicrafts and utensils (NUNES et al., 2016; ALBUQUERQUE et al., 2007; ANGELIM et al., 2007; CARVALHO et al., 2010; NASCIMENTO et al., 2012; OLIVEIRA-JÚNIOR et al., 2014; JUVIK et al., 2017), among others.

Thus, the objective of this study was to present and discuss the species that occur in sympathies with the macambiras in Serra do Jatobá, municipality of Milagres, Bahia, Brazil.

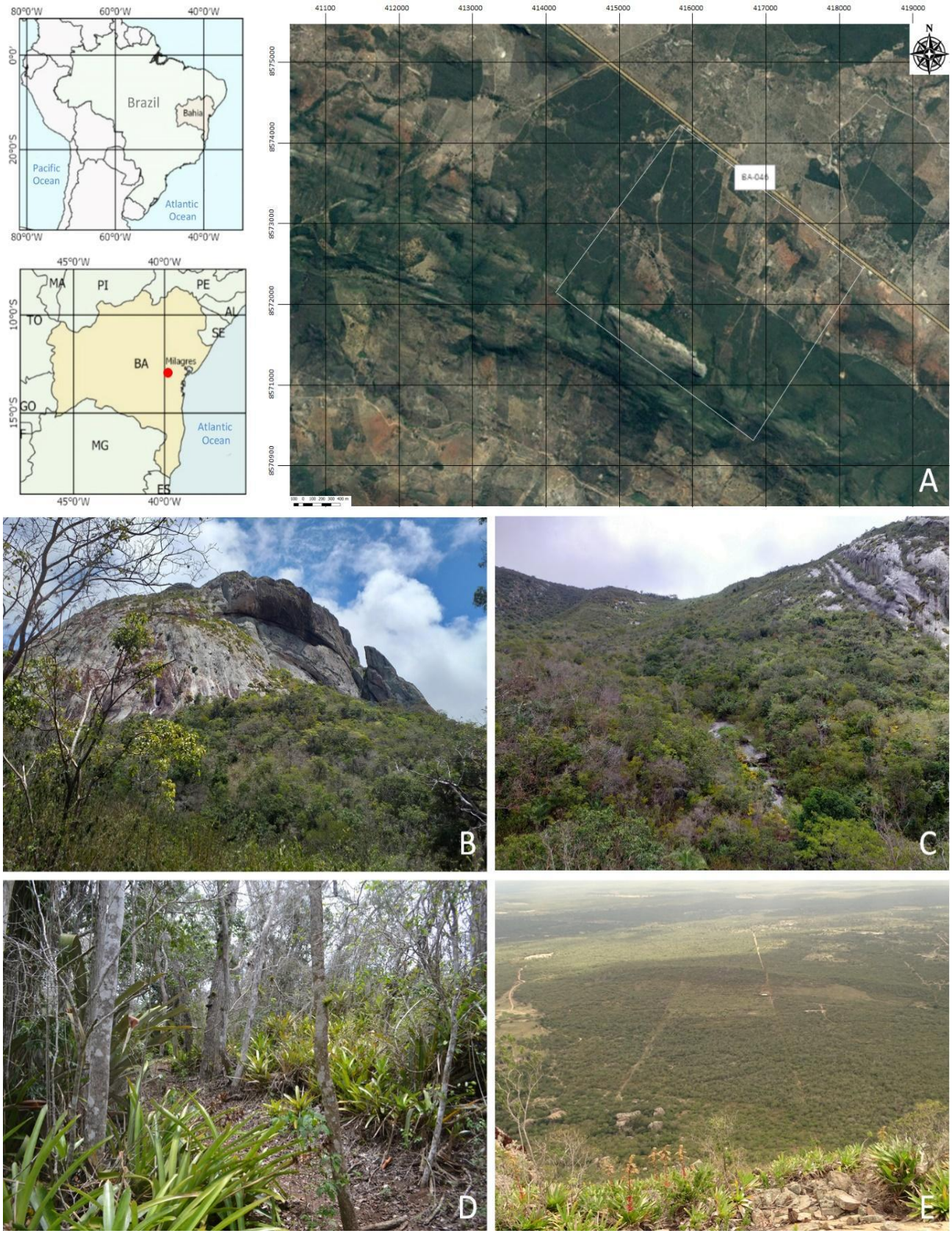
Material and Methods

The study was carried out in Serra do Jatobá, in the municipality of Milagres, Bahia, Brazil, under the coordinates 12° 55' 24" S and 39° 46' 43" W (Figure 1). The region is inserted in a transition zone of the Caatinga and Atlantic Forest. The Jatobá community has an inselberg, typified as "whaleback", reaching 392 in height, 1,670 meters long, and 1,417 meters wide (CARVALHO et al., 2020). The municipality has an aridity index of 58.1, average annual precipitation around 480.5 mm irregularly distributed, high temperatures, and an average annual of 23.0 ºC (SEI, 1999).

The climate of the Jatobá community is classified as BSh, according to Köppen and Geiger (1928). Its origin comes from the outcrop of granitic rock arranged in groups (AB´SABER, 1969). Its lithology originates in the low limit of Precambrian, consisting of gneisses, migmatites, and granite intrusions (SANTOS; SALGADO, 2010).

According to Carvalho et al. (2020), the evaluated area has different ecosystems: top of the inselberg with exposed rocky outcrop (Figure 1B), Caatinga conserved with hillside (Figure 1C), semideciduous forest at the top of the inselberg (Figure 1D) and anthropized area used by agriculture (Figure 1E). The hillside areas exposed rocky outcrop, and top covered by semideciduous vegetation are more conserved areas, although sporadically, there is grazing activity.

Figure 1. A) Serra do Jatobá, Milagres - BA, Brazil. B) Front view of inselbergs. C) Caatinga preserved with the hillside. D) Semidecidual forest at the top of the inselberg. E) Top view of the anthropized area used by agriculture. Photos: A) Google Earth. B-D) E.H. Souza. E) A.J.A. Carvalho.



Monthly collections were carried out in an area of 20 km^2 of Serra do Jatobá. The collected samples were deposited in the Herbarium of the Recôncavo da Bahia (HURB) from the Universidade Federal do Recôncavo da Bahia (UFRB) and after being identified. The life forms of the species were evaluated as epiphyte, rupicolous and terrestrial, and plants' frequency was assessed as: rare <10 individuals; infrequent 11 to 50 individuals; very frequent 51 to 250 individuals; and abundant >250 individuals.

Results and Discussion

Thirty-seven species belonging to three subfamilies, Bromelioideae (19 spp.), Tillandsioideae (16 spp.) and two species of Pitcairnioideae and 14 genera of Bromeliaceae (*Tillandsia* - 13 spp. and *Hohenbergia* - 4 spp. were the most representative genera) (Table 1 and Figure 2) were observed occurring in sympatry with the macambira species in Serra do Jatobá. The genera *Alcantarea*, *Bromelia*, *Cryptanthus*, *Dyckia*, *Encholirium*, *Karawata,* and *Neoglaziovia,* presented only one species each (Table 1). Sympatry is defined as when two or more populations overlap without crossings between individuals of different species in the same geographical distribution (COYNE, 2007).

Encholirium spectabile is a rupicolous species, rarely terrestrial, and has been observed at the top of rocky outcrops in reduced populations or areas of difficult access due to hillside, forming clumps. *Bromelia laciniosa* was observed as a terrestrial plant in the preserved Caatinga of lowland and hillside with reduced populations, possibly due to grazing.

Wendt et al. (2008), when studying the reproduction and ecology of pollination in a fragment of Atlantic Forest in the Santa Lucia Biological Station in the municipality of Santa Teresa (ES), observed 42 species of bromeliads occurring in sympatry, distributed in nine genera (*Aechmea, Billbergia, Edmundoa, Neoregelia, Nidularium, Quesnelia, Racinaea, Tillandsia* and *Vriesea*). These authors also discussed the role of isolation, phenological, ethological, and microhabitat as potential pre-zygotic barriers between species. Most species of Bromeliaceae shared a similar set of floral visitors, being the hummingbird *(Ramphodon naevius,* Dumont, 1818) the main one between 35 species; only one hybrid was observed in the study area (WENDT et al., 2008). This low hybridization is intriguing, given that the pre-zygotic isolation mechanisms investigated are potentially weak to effectively avoid interspecific pollination (WENDT et al., 2008). It is worth mentioning that in our study, we did not observe any natural hybrid among the observed populations.

The species studied here present different life forms ranging from strictly epiphyte plants (44%), having the Licuri Trees (*Syagrus coronata* (Mart.) Becc.) as the main phorophyte, strictly terrestrial species (16%), to strictly rupicolous (13%), and 27% of them presenting more than one life form.

Table 1. Bromeliaceae species, frequency and life form in Serra do Jatobá, Bahia, Brazil. RA = rare <10 individuals; UN = uncommon, from 11 to 50 individuals; VF = very frequent, from 51 to 250 individuals; AB = abundant >250 individuals. TER = terrestrial; RUP = rupicolous; EPI = epiphyte.

	Species	Subfamily	Freq.	Live form
1	*Aechmea aquilega* (Salisb.) Griseb.	Bromelioideae	VF	TER
2	*Aechmea disjuncta* (L.B.Sm.) Leme & J.A.Siqueira	Bromelioideae	UN	EPI
3	*Aechmea perforata* L.B.Sm.	Bromelioideae	RA	TER
4	*Alcantarea nahoumii* (Leme) J.R.Grant	Tillandsioideae	AB	RUP
5	*Billbergia euphemiae* E.Morren	Bromelioideae	UN	EPI
6	*Billbergia porteana* Brongn. ex Beer	Bromelioideae	VF	EPI
7	*Billbergia macrocalyx* Hook.	Bromelioideae	AB	TER
8	*Bromelia laciniosa* Mart. ex Schult.f.	Bromelioideae	UN	TER
9	*Cryptanthus bahianus* L.B.Sm.	Bromelioideae	AB	TER/ RUP
10	*Dyckia milagrensis* Leme	Pitcairnioideae	AB	RUP
11	*Encholirium spectabile* Mart. ex Schult. & Schult.f.	Pitcairnioideae	UN	RUP/ TER
12	*Hohenbergia blanchetii* (Baker) Mez	Bromelioideae	RA	EPI
13	*Hohenbergia flava* Leme & C.C.Paula	Bromelioideae	AB	TER/ RUP
14	*Hohenbergia lanata* Pereira & Moutinho	Bromelioideae	RA	EPI
15	*Hohenbergia sandrae* Leme	Bromelioideae	RA	TER/ EPI
16	*Karawata multiflora* (L.B.Sm.) J.R.Maciel & G.Sousa	Bromelioideae	VF	EPI/ TER
17	*Neoglaziovia variegata* (Arruda) Mez	Bromelioideae	AB	TER
18	*Orthophytum maracasense* L.B.Sm.	Bromelioideae	RA	TER/ RUP
19	*Orthophytum rubrum* L.B.Sm.	Bromelioideae	RA	TER
20	*Orthophytum saxicola* IUle) L.B.Sm.	Bromelioideae	AB	TER/ RUP
21	*Tillandsia candida* Leme	Tillandsioideae	RA	EPI
22	*Tillandsia chapeuensis* Rauh	Tillandsioideae	AB	RUP
23	*Tillandsia gardneri* Lindl.	Tillandsioideae	UN	EPI
24	*Tillandsia geminiflora* Brongn.	Tillandsioideae	RA	EPI
25	*Tillandsia juncea* (ruiz & Pav.) Poir.	Tillandsioideae	RA	EPI
26	*Tillandsia loliacea* Mart. ex Schult. & Schult.f.	Tillandsioideae	VF	EPI
27	*Tillandsia milagrensis* Leme	Tillandsioideae	AB	RUP
28	*Tillandsia polystachia* (L.) L.	Tillandsioideae	UN	EPI
29	*Tillandsia recurvata* (L.) L.	Tillandsioideae	AB	EPI
30	*Tillandsia streptocarpa* Baker	Tillandsioideae	VF	EPI/ RUP
31	*Tillandsia stricta* Sol.	Tillandsioideae	VF	EPI
32	*Tillandsia tenuifolia* L.	Tillandsioideae	UN	EPI
33	*Tillandsia usneoides* (L.) L.	Tillandsioideae	AB	EPI
34	*Vriesea neoglutinosa* Mez	Tillandsioideae	VF	RUP
35	*Vriesea procera* (Mart. ex Schult.f.) Wittm.	Tillandsioideae	UN	EPI
36	*Wittmackia bicolor* (L.B.Sm.) Aguirre-Santoro	Bromelioideae	UN	TER/ EPI
37	*Wittmackia lingulatoides* (Leme & H.Luther) Aguirre-Santoro	Bromelioideae	AB	TER/ RUP

Figure 2. Some species of Bromeliaceae present in Serra do Jatobá, Milagres, Bahia. A) *Alcantarea nahoumii*. B) *Dyckia milagrensis*. C) *Orthophytum saxicola*. D) *Hohenbergia flava*. E) *Wittmackia lingulatoides*. F) *Tillandsia chapeuensis*. G) *Cryptanthus bahianus*. H) *Tillandsia usneoides*. I) *Karawata multiflora*. J) *Hohenbergia sandrae*. K) *Hohenbergia lanata*. L) *Aechmea aquilega*. M) *Tillandsia streptocarpa*. N) *Neoglutinous vriesea*. Photos: E.H. Souza.



Epiphytism is related to a series of adaptations for obtaining and maintaining nutrients and water, resulting in different spatial distribution patterns in forests and in the paraphytes themselves that support them (BENZING, 1990). Bromeliaceae has approximately 80% of species adapted to epiphytic life, occurring mainly in tropical regions' forests (GENTRY; DODSON, 1987; LUGO; SCATENA, 1992; BENZING, 2000).

The success of the family epiphytism is mainly related to the distribution of juxtaposed leaves in rosette in tank form, favoring the accumulation of water, which is called phytotelma (BENZING, 2000). Carvalho et al. (2020), when studying only epiphyte species that use Licuri Trees as a phorophyte in Serra do Jatobá, they have observed 57 species, 38 genera, and 17 families, 21 spp. of Bromeliaceae, much lower than found in the present study (37 spp.), because terrestrial and rupicolous species were also considered. Carvalho et al. (2020) reported that the abundance of species found in the Serra do Jatobá is justified by being an area located 30 km from the Atlantic Forest (ecotones) and because it has an altitude difference with which they are externalized in the relief, in the existing soil and vegetation classes.

The number of Bromeliaceae species observed in the Serra do Jatobá (37 spp.) was much higher than those recorded for several surveys in different phytogeographic domains of Bahia (FRANÇA et al., 1997; ALVES, 2005; AMORIM et al., 2005; REIS; FONTOURA, 2009) and Brazil. Franca et al. (1997), when studying the flora of two inselbergs in this same region (Morro das Tocas and Morro do Agenor, both in the municipality of Itatim), observed 266 spp. and 78 families of vascular plants, of which 181 spp. in Morro das Tocas and 192 spp. in Morro do Agenor. The families with the highest number of species were Euphorbiaceae (19 spp.) and Bromeliaceae with 14 spp. in 9 genera. The authors mention the insufficiency of studies of flora surveys of the Caatinga of Bahia and mention the difficulty of confirming the diversity in these environments, even with a large number of species and genera. Amorim et al. (2005) and Reis and Fontoura (2009) studied the vascular flora and the diversity of epiphyte bromeliads in the Serra do Teimoso Natural Heritage Private Reserve, in the municipality of Jussari (BA) in an area of transition between the ombrophilous and semideciduous forests and observed 23 and 19 species, respectively. Alves (2005) recorded 31 species in the Una Biological Reserve in Bahia. Alves (2005) and Reis and Fontoura (2009) concluded that the results are in accordance with the pattern of lower epiphyte diversity in drier forests when compared to the Atlantic Forest.

Benzing (2000) reported that the Bromeliaceae family has some species capable of occupying extremely xeric environments, but the presence of a moisture source is necessary for higher densities of these plants. It is worth mentioning that the Caatinga has a less extreme temperature during the rainy season. During specific periods of the dry season, when fog forms, especially at night, it was observed that the higher altitude areas favor germination and the perfect microhabitat for many species of *Tillandsia* and other Bromeliaceae, mainly due to the presence of specialized trichomes.

In the present study, 36% of the species were considered abundant, 17% very frequent, 25% uncommon, and 22% rare. The largest species are *Alcantarea nahoumii* (Figure 5A), *Dyckia milagrensis* (Figure 5B), *Orthophytum saxicola* (Figure 5C), *Hohenbergia flava* (Figure 5D), and *Wittmackia lingulatoides* (Figure 5E). All of these occur in rocky outcrops at the top of the inselberg, except for *H. flava* and *W. lingulatoides,* which are also found in the Caatinga preserved with the hillside. *Alcantarea nahoumii* is a species considered 'Vulnerable' and occurs exclusively in the inselbergs of Bahia (BAHIA, 2017; IUCN 2021), and there are already reports of its use as an ornamental plant, which has been promoting predatory extractivism (VERSIEUX, 2021).

Wittmackia lingulatoides covers extensive areas of rocky outcrops and conserved Caatinga (Figure 5E), as well as inhabits Licuri Trees. It is known as gravatá-de-trança due to its long stolons forming large clusters.

Tillandsia milagrensis and *T. chapeuensis* (Figure 5F) are found in abundance, attached to the rocky inselberg walls. They have a landscape effect in the flowering season, besides attracting numerous pollinator species, mainly hummingbirds. *Tillandsia milagrensis* is an endemic species in the region of Milagres, Itatim, and Iaçu and is considered 'Endangered' according to the Official List of Endemic Species of Flora Threatened with Extinction of the State of Bahia (BAHIA, 2017). In turn, *T. chapeuensis* is a species endemic to Bahia, and because it has excellent ornamental potential, it has suffered intense extractive collections by collectors and plant traders. In recent years, it has been observed that in some *Tillandsia* populations, there has been a drastic reduction in the number of plants or even extinction of some populations in the habitat, caused by predatory extractivism or extractivism for commercial purposes of groups that communicate mainly over the Internet. Therefore, due to their ecological, landscape, and floristic importance, the inselberg regions of Bahia need to be inserted and their species secured in conservation units.

Billbergia macrocalyx occurs in a fragment of the semideciduous forest also at the top of the inselberg, and its inflorescences last from 2 to 4 days. *Cryptanthus bahianus* (Figure 5G), and *N. variegata* form the soil of the caatinga area preserved at the base of the inselberg. *Neoglaziovia variegata* is known as caroá and is widely used for string making, handicrafts, and even animal feed in the driest season. This species has been collected directly in the Caatinga in an extractive way, without any systematization of cultivation, already practically disappearing in some regions of Bahia (SILVEIRA et al., 2011).

Tillandsia usneoides is a strictly epiphyte species found in abundance throughout the study area (Figure 5H). This species has the most extensive Neotropical distribution among Bromeliaceae and has several use potentials, such as air bioindicators (FIGUEIREDO et al., 2004), ornamental potential, and medicinal properties of which were recorded the presence of ascorbic acid, carotenoids, flavonoids, xanthones, coumarins, and tannins (MANETTI et al., 2009; VIEIRA; CAPLAN, 2011).

Aechmea perforata is a species with ornamental potential and stands out among the rare species. It was observed in the semideciduous forest at the top of the inselberg along with *Karawata multiflora* (Figure 5I), differentiating from the latter by the plants' size in the vegetative phase. *Hohenbergia blanchetii*, *H. sandrae* (Figure 5J), and *H. lanata* (Figure 5K) are epiphyte species. *Hohenbergia sandrae* can also be found forming clumps on the floor. These three species were observed in the semideciduous forest at the top of the inselberg. *Hohenbergia lanata* was also found in the Caatinga, preserved in the highest altitudes of the mountain range. The small populations are very sparse and survive mainly on Licuri Trees. Cavalcante et al. (2021), after 30 years, rediscovered *H. lanata* in the study area and suggested that the species be treated as 'Critically Endangered' of extinction.

Orthophytum rubrum was observed in small terrestrial populations in the semideciduous forest at the top of the inselberg. *Tillandsia candida*, *T. geminiflora,* and *T. juncea* are epiphyte species with sparse plants also occurring in the semideciduous forest at the top of the inselberg. *Orthophytum maracasense* was observed in the conserved Caatinga of the hillside in small populations.

Aechmea disjuncta, Billbergia euphemiae, Vriesea procera, and *Wittmackia bicolor* were observed in small epiphyte populations. *Wittmackia bicolor* also presents itself as terrestrial in the semideciduous forest, occurring at the top of the inselberg and has been considered an ornamental species (SOUZA et al., 2015). According to the official list of Bahia, *Aechmea disjuncta* is considered 'In Danger' (BAHIA, 2017). *Tillandsia gardneri, T. polystachia, T. tenuifolia* are observed in isolation throughout the study area, being more abundant in the semideciduous forest at the top of the inselberg.

Finally, the most frequent species was *Karawata multiflora* which e; occurs as epiphyte and terrestrial and is popularly known as "Chupa-Chupa". *Billbergia porteana, T. loliacea, T. stricta,* and *T. streptocarpa* (Figure 5M) are epiphyte species dispersed in the area, mainly at low altitudes. *Aechmea aquilega* (Figure 5L) was observed as terrestrial in the Caatinga preserved from lowland and hillside. *Vriesea neoglutinosa* (Figure 5N) was observed together with *A. nahoumii* in a smaller number forming mass on the rocky outcrop at the top of the inselberg.

It can be concluded that from the 37 species observed, 70.26% are endemic to Brazil (FORZZA et al., 2020). From these, 32.4% occur exclusively in Bahia. As for the status conservation, the species *Aechmea disjuncta* and *Tillandsia milagrensis* are considered 'Endangered', and *Alcantarea nahoumii* and *Orthophytum rubrum* are considered 'Vulnerable'.

The results presented here may support conservation studies of these species and, in the future, support the creation of a conservation unit of the Inselbergs of Bahia. These environments are maintainers of biodiversity and function as "oasis" of significant endemism in the Caatinga, besides having some species on the endangered list.

Acknowledgments

The work was supported by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (PNPD/UFRB - 88882.315208/2019-01; PROCAD 88881.068513/2014-01) and the Conselho Nacional de Desenvolvimento Científico e Tecnológico (Project Nº. 402695/2017-8). We would also like to thank the jatobá community along with the Association of Producers of Ouricuri do Jatobá (APOJ).

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Article Information

Received on: 21/04/2021 -- Accepted in: 28/04/2021 -- Published on: 01/07/2021

Conflict of Interest: No reported.

How to cite this article

Souza, E. H. *et al.,* (2021). Macambiras and sympatric species of Serra do Jatobá, Milagres, Bahia, Brazil. **Revista Macambira**, 5(2), e052001. https://doi.org/10.35642/rm.v5i2.569.

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