

# Vascular flora of semi-arid region, São José do Piauí, state of Piauí, Brazil

Maura Rejane de Araújo Mendes<sup>1\*</sup> and Antonio Alberto Jorge Farias Castro<sup>2</sup>

<sup>1</sup> Universidade Estadual do Piauí, Departamento de Biologia, Avenida Nossa Senhora de Fátima s/n. CEP 64202-220. Parnaíba, PI, Brazil.

<sup>2</sup> Universidade Federal do Piauí, Departamento de Biologia, Avenida Ininga. CEP 64049-550. Teresina, PI, Brazil.

\* Corresponding author. E-mail: [maurarejanem@gmail.com](mailto:maurarejanem@gmail.com)

**ABSTRACT:** The Caatinga biome is located in the semi-arid region of northeastern Brazil and covers about 37 % of Piauí state. The main objective of the present study was a characterization of the Caatinga flora of the farm of Morro do Baixo, in state of Piauí, Brazil (06°51'13" S; 41°28'15" W, at 400 to 540 m above sea level) in view of the fact that very few such surveys were conducted in the state. The flora of the farm was surveyed monthly, during a year, to gather herbs, epiphytes, parasites, sub shrubs, shrubs and trees. We encountered 136 species belonging to 46 families, including a new species of *Bauhinia*. The richest families were Caesalpiniaceae (15 spp.), Fabaceae (11 spp.), Bignoniaceae and Mimosaceae (both with nine spp.). We observed a higher frequency of typical species from sedimentary Caatinga. However, local conditions favor the appearance of species that occur in Carrasco and Cerrado.

## INTRODUCTION

The semi-arid of Brazil extends over 800,000 km<sup>2</sup>, approximately 10 % of the national territory within the states of Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe, Bahia and Northern Minas Gerais, delimited by the medium isoietia of 800 mm (Ab'Sáber 1974; Hueck 1972). This region presents heavy rains in some years, prolonged drought periods in others, with irregular and concentrated in a few months, higher evapotranspiration rates and low infiltration capacity of soils (Ab'Sáber 1974; Reis 1976; Kampen 1979).

The Caatinga is the dominant vegetation of the semi-arid region (Luetzelburg 1923; Engler 1951) which has been suffering severe environmental degradation in recent decades, mainly as a consequence of rural growth and expansion of agriculture and cattle grazing. Among different types of Caatingas, those located in sedimentary areas have been the focus of very few studies until recently.

The state of Piauí accounts for 37 % of the area of Caatinga biome and according to Sampaio (2002) 118 municipalities within the state are included in the semi-arid domain. The lack of such information has motivated the inclusion of sites such as the microrregion of Picos in Piauí as priority area for the conservation of the Caatinga biome (Silva *et al.* 2004).

In the present study, we aimed provide a check list the vascular flora of the municipality of São José do Piauí, a priority area for conservation, identifying the species which occur in the region in crystalline and sedimentary formations and determining whether the life-forms differ from the normal spectrum of Raunkiaer's system.

## MATERIALS AND METHODS

The present study was carried out in the municipality of São José do Piauí, within the Picos microrregion in Piauí state, in a privately owned property called Morro do Baixo (06°51'13" S; 41°28'15" W, at 400 to 540 m above sea level) (Figure 1). According IBGE classification (Veloso *et*

*al.* 1991), the vegetation is characterized by steppe-savana. Based on temperature data, estimated through linear regression equations, and precipitation of 14 years (1984-1998) obtained from the São José Meteorology Station (Secretaria de Agricultura, Abastecimento e Recursos Hídricos – Departamento de Hidrometeorologia), the mean annual rainfall was 816.4 mm, with nine months of water deficit. The climate is Dd2A'3a' (Thorntwaite and Mather 1955), characterized as semi-arid with little hydric excess and small thermal annual amplitude. This area is dated to Paleozoic and belongs to the sedimentary firth of Piauí-Maranhão. The lithology is characterized predominantly by sandstones, shales and silts of the Serra Grande, Pimenteira and Cabeça formations. Geomorphologically, it is located in the Eastern Plateau of Piauí, with the surface exhibiting varied dissection features (Jacomine *et al.* 1986; Ramos and Sales 2001).

The vascular flora was surveyed monthly, during a year in a 2 ha area, to collect herbs, epiphytes, parasites, lianas, sub shrubs, shrubs and trees, throughout the study area. All specimens collected were identified and

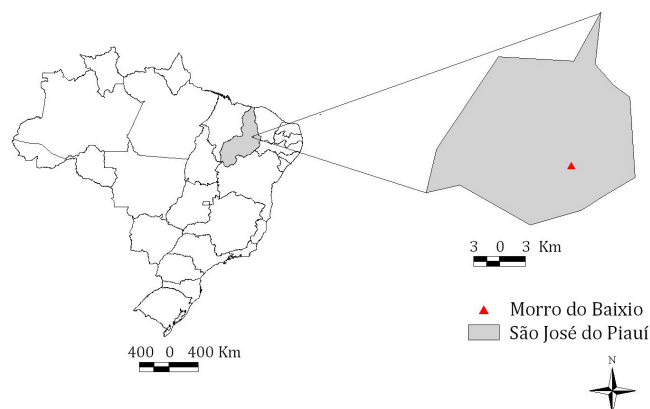


FIGURE 1. Location of the property Morro do Baixo in São José do Piauí, state of Piauí, Brazil.

subsequently incorporated into the TEPB Herbarium collection. Data was organized listing the species and their families, according Cronquist (1988) for convenience of comparison to some floristic lists of Caatinga (Rodal *et al.* 2008; Araújo *et al.* 1995; Ferraz *et al.* 1998; Rodal *et al.* 1999; Figueirêdo *et al.* 2000; Alcoforado-Filho *et al.* 2003; Lemos 2004; Araújo *et al.* 2005; Rodal *et al.* 2005; Costa *et al.* 2007), carrasco (Araújo *et al.* 1998; Araújo and Martins 1999), Caatinga-Carrasco transition (Oliveira *et al.* 1997), evergreen shrub vegetation (Rodal *et al.* 1998), transition from Campo Maior Complex (Farias and Castro 2004) and Cerrado (Castro *et al.* 1998; Ribeiro and Tabarelli 2002).

Species were classified as phanerophytes, chamaephytes, hemicytopytes, geophytes, therophytes, lianas, epiphytes and parasites, according Raunkiaer (1934), adapted by Mueller-Dombois and Ellenberg (1974), to compare the Caatinga life-form spectrum with Raunkiaer's normal spectrum. This classification is based on the meristematic tissue, which remains inactive to growth during unfavorable season (as dry summer or winter), and therefore the location of this tissue is an essential feature of plant's adaptation to climate (Whittaker 1975). To verify if the life-form spectrum shows significant differences to Raunkiaer's normal spectrum, we used a  $\chi^2$  test (Zar 1999). For this comparison, lianas were included like phanerophytes, and epiphytes and woody parasites excluded from the statistical analysis.

## RESULTS AND DISCUSSION

We recorded 136 species distributed among 104 genera and 47 families (Table 1), including one new species of *Bauhinia*. The families with the greatest number of species were Caesalpiniaceae (15), Fabaceae (11), Bignoniaceae and Mimosaceae (9), Cactaceae and Malpighiaceae (6), and Euphorbiaceae (5), represented by 44.85 %. Twenty one families (44.68 %) were represented by only a single species. In terms of genera, Fabaceae (11), Caesalpiniaceae (7), Bignoniaceae (6), Euphorbiaceae, Malpighiaceae and Mimosaceae (5) were the most representative, being *Bauhinia* (6), *Aspidosperma*, *Eugenia* and *Senna* (3) with the largest number of species.

A comparison of the flora encountered in the presented study with reports from the literature for crystalline and sedimentary formations revealed 33 species (27.96 %) occurring only in the study area, while 85 species (72.03 %) were cited in at least one of the earlier reports. Generally, the more frequent families encountered in this study were representative of the crystalline and sedimentary formations in the semi-arid domain, except for Malpighiaceae. Euphorbiaceae, Mimosaceae, Caesalpiniaceae and Cactaceae could be found in crystalline areas (Rodal *et al.* 2008; Araújo *et al.* 1995; Ferraz *et al.* 1998; Alcoforado-Filho *et al.* 2003). In addition to these species, Bignoniaceae, Fabaceae and Myrtaceae could be found in the sedimentary areas, but not Cactaceae (Araújo *et al.* 1998; Araújo and Martins 1999; Lemos 2004).

Rodal *et al.* (2008) reported that Euphorbiaceae, Cactaceae and Caesalpiniaceae were the families with the largest number of species in Caatinga. Lemos and Rodal (2002), studying a deciduous thorny vegetation in the state of Piauí, found that, except for Bignoniaceae and Myrtaceae, there was no distinction between families

with the largest number of species in crystalline and sedimentary formations. However, analyzing the species distribution of these families, we found that there were differences among crystalline and sedimentary formations. The higher proportion of species in common (32.2 % with 38 species) occurred in Caatinga sedimentary formations (Rodal *et al.* 2008; Rodal *et al.* 1999; Figueiredo *et al.* 2000; Lemos 2004), followed by Carrasco (31.35 % with 37 species) (Araújo *et al.* 1998; Araújo and Martins 1999), and crystalline formations (29.81 % with 34 species) (Rodal *et al.* 2008; Araújo *et al.* 1995; Ferraz *et al.* 1998; Alcoforado-Filho *et al.* 2003; Lemos 2004, Araújo *et al.* 2005; Rodal *et al.* 2005; Costa *et al.* 2007).

*Spondias tuberosa* Arruda (Anacardiaceae), *Cuspidaria argentea* (Wawra) Sandw., *Mansoa hirsuta* DC. (Bignoniaceae), *Tournefortia rubicunda* Salzm. ex DC. (Boraginaceae), *Pilosocereus piauhyensis* (Werdm.) Byles & Rowley (Cactaceae), *Chamaecrista eitenorum* (Irwin & Barneby) Irwin & Barneby, *Poeppigia procera* Presl. (Caesalpiniaceae), *Crotalaria holosericea* Nees & Mart. (Fabaceae), *Anadenanthera colubrina* var. *cebil* (Griseb.) Altschul (Mimosaceae), *Ximenia americana* L. (Olacaceae) and *Cardiospermum corindum* L. (Sapindaceae) occurred both in crystalline and sedimentary areas. *Spondias tuberosa* and *Pilosocereus piauhyensis* were the only endemic species (Giulietti *et al.* 2002). The geographical distribution of *Poeppigia procera* needs further investigation and *Crotalaria holosericea* is typical of degraded areas of Caatinga (Queiroz 2002).

We found 24 species (20.34 %) with lists for Cerrado from the state of Piauí (Castro *et al.* 1998; Ribeiro and Tabarelli 2002) and 22 species (18.64 %) with transition from Campo Maior Complex (Farias and Castro 2004). The most common species in 17 flora lists, including this study, were *Cereus jamacaru* DC. (12 lists), *Rollinia leptopetala* (R.E.Fries) Safford (9), *Commiphora leptophloeos* (Mart.) Gillet, *Bauhinia cheilantha* (Bong.) Steud. (8) and *Aspidosperma pyrifolium* Mart. (8). These, except *Bauhinia cheilantha*, were cited by Giulietti *et al.* (2002) as endemic of Caatinga. However, Taylor and Zappi (2002) affirm that these species, despite being predominant, also occur in other vegetation types. *Aspidosperma pyrifolium* also occurred in Cerrado and *Commiphora leptophloeos* in Carrasco and Cerrado. *Bauhinia cheilantha* is cited by many authors (Ferraz *et al.* 1998; Lemos and Rodal 2002) as occurring in crystalline and sedimentary formations.

The flora life-form spectrum in this study showed a high proportion of phanerophytes (64.70 %) followed by lianas (12.50 %), hemicytopytes (8.09 %), chamaephytes (5.88 %), geophytes (3.68 %), therophytes (2.94 %), epiphytes (1.47 %) and parasites (0.73 %). Excluding the epiphytes and the parasites, and including the lianas as phanerophytes in the statistical analysis, the life-form spectrum increases the proportion of the phanerophytes (78.95 %), the same dominant pattern observed for Raunkiaer's normal spectrum (Table 2). The  $\chi^2$  test demonstrated significant differences between the study area flora and Raunkiaer's normal spectrum ( $\chi^2 = 45.20$ ,  $p < 0,001$ ). Phanerophytes had the highest individual value obtained from  $\chi^2$  test (52.21 %).

It is important to note that Raunkiaer's normal spectrum was created for world flora and take into account

homogeneous climatic conditions (Cain 1950). The  $\chi^2$  test showed significant differences of São José flora from the normal spectrum. Phanerophytes and hemicytrophytes were already cited as the main life-forms of Cerrado (Batalha and Martins 2004).

Studies in semi-arid regions of northeastern Brazil are scarce except for recent studies carried out in Ceará and Pernambuco states (Araújo *et al.* 2005; Rodal *et al.* 2005; Costa *et al.* 2007). Therophytes are expected to register higher proportions in high temperature and low precipitation areas, characterizing the life-form spectrum of arid and semi-arid regions (Raunkiaer 1934; Araújo *et al.* 2005). However, our results show phanerophytes to be dominant, similar to the pattern were found in dry forests and Carrasco areas of the state of

Ceará (Araújo *et al.* 2005). This probably must be associated with the precipitation and altitudinal conditions of the study area, as well as the smaller number of species in the herbaceous/sub shrub layer when compared to shrub/woodland layer (99 species, including the woody lianas), a common pattern of sedimentary formations (Rodal *et al.* 1999; Figueiredo *et al.* 2000; Araújo *et al.* 2005).

The flora of Morro do Baixio was composed by a high frequency of typical species of sedimentary Caatinga. However, the geoenvironment of the São José municipality within the "cuesta" of Serra Grande (Rivas 1996) is characterized as a region of Cerrado/Caatinga/Carrasco transition, determining the appearance of species that occur in these formations.

**TABLE 1.** List of species, common names, families, and their life-forms in Morro do Baixio, municipality of São José do Piauí, state of Piauí, Brazil.

FAMILY/SPECIES	COMMON NAME	LIFE-FORM
<b>ACANTHACEAE</b>		
<i>Ruellia</i> sp.	-	Hemicytrophyte
<b>AMARANTHACEAE</b>		
<i>Gomphrena</i> aff. <i>leucocarpa</i> Mart.	-	Hemicytrophyte
<i>Pfaffia</i> sp.	-	Hemicytrophyte
<b>ANACARDIACEAE</b>		
<i>Apterokarpus gardneri</i> (Engler) Rizzini	aroeira-brava	Phanerophyte
<i>Myracrodruon urundeuva</i> Allemão	aroeira	Phanerophyte
<i>Spondias tuberosa</i> Arruda	umbu	Phanerophyte
<b>ANNONACEAE</b>		
<i>Rollinia leptopetala</i> (R.E.Fries) Safford	bananinha/açoita	Phanerophyte
<b>APOYNACEAE</b>		
<i>Aspidosperma</i> sp.	pequiá	Phanerophyte
<i>Aspidosperma multiflorum</i> A.DC.	pereiro-branco	Phanerophyte
<i>Aspidosperma pyrifolium</i> Mart.	pereiro-preto	Phanerophyte
<b>ARACEAE</b>		
<i>Tacarum peregrinum</i> L.	milho-de-cobra	Geophyte
<b>ARISTOLOCHIACEAE</b>		
<i>Aristolochia</i> sp.	-	Geophyte
<b>ASCLEPIADACEAE</b>		
<i>Schubertia</i> cf. <i>multiflora</i> Mart.	flor-de-cera	Liana
<i>Petalostelma</i> sp.	cipó-de-tamanduá	Liana
<b>ASTERACEAE</b>		
<i>Pithecoseris pacourinoides</i> Mart.	-	Hemicytrophyte
<b>BIGNONIACEAE</b>		
<i>Bignonia</i> sp.	cipó-de-arco	Liana
<i>Cuspidaria argentea</i> (Wawra) Sandw.	-	Phanerophyte
<i>Godmania dardanoi</i> (J.C.Gomes) A.H.Gentry	chifre-de-carneiro	Phanerophyte
<i>Jacaranda jasminoides</i> (Thunb.) Sandw.	jacaranda/carobinha	Phanerophyte
<i>Jacaranda praetermissa</i> Sandw.*	caroba	Phanerophyte
<i>Mansoa hirsuta</i> DC.	cipó-de-alho	Liana
<i>Mansoa difficilis</i> (Cham.) Bur. and K.Schum.	cipó-de-tamanduá	Liana
<i>Tabebuia impetiginosa</i> (Mart. ex DC.) Standl.	pau-d'arco-roxo	Phanerophyte
<i>Tabebuia serratifolia</i> (Vahl.) Nich.	pau-d'arco-amarelo	Phanerophyte
<b>BIXACEAE</b>		
<i>Cochlospermum vitifolium</i> (Willd.) Spreng.	algodão-bravo	Phanerophyte
<b>BOMBACEAE</b>		
<i>Eriotheca</i> sp.	barriguda	Phanerophyte
<i>Pseudobombax marginatum</i> (A.St.-Hil.) A.Robyns	imbitatanha	Phanerophyte
<b>BORAGINACEAE</b>		
<i>Cordia rufescens</i> A.DC.	grão-de-galo	Phanerophyte
<i>Cordia trichotoma</i> Vell.	frei-jorge/freijó	Phanerophyte
<i>Tournefortia rubicunda</i> Salzm. ex DC.	cipó-de-anjo	Liana
<b>BROMELIACEAE</b>		
<i>Bromelia plumieri</i> (E.Morren) L.B.Sm.	macambira	Hemicytrophyte
<i>Tillandsia loliacea</i> Mart. ex Schult.F.	-	Epiphyte
<i>Tillandsia streptocarpa</i> Baker	-	Epiphyte
<b>BURSCEAE</b>		
<i>Commiphora leptophloeos</i> (Mart.) Gillet	imburana-de-cambão	Phanerophyte

**TABLE 1.** List of species, common names, families, and their life-forms in Morro do Baixio, municipality of São José do Piauí, state of Piauí, Brazil. (Continued)

FAMILY/SPECIES	COMMON NAME	LIFE-FORM
<b>CACTACEAE</b>		
<i>Cereus albicaulis</i> (Britton & Rose) Luetzelb.	rabo-de-raposa	Phanerophyte
<i>Cereus jamaclaru</i> DC.	mandacaru	Phanerophyte
<i>Melocactus zehntneri</i> (Britton and Rose) Luetzelb	croa-de-frade	Camephyte
<i>Pilosocereus gounellei</i> (F.A.C. Weber) Byles and Rowley	xique-xique	Phanerophyte
<i>Pilosocereus piauhyensis</i> (Werdm.) Byles and Rowley	facheiro	Phanerophyte
<i>Tacinga inamoena</i> (K.Schum) N.P.Taylor and Stuppy	palmatória	Camephyte
<b>CAESALPINIACEAE</b>		
<i>Bauhinia cheilantha</i> (Bong.) Steud.	mororó	Phanerophyte
<i>Bauhinia pentandra</i> (Bong.) Steud.	mororó	Phanerophyte
<i>Bauhinia pulchella</i> Benth.	mororó	Phanerophyte
<i>Bauhinia subclava</i> Benth.	mororó	Phanerophyte
<i>Bauhinia</i> sp. nov.	mororó	Phanerophyte
<i>Bauhinia unguolata</i> L.	mororó	Phanerophyte
<i>Caesalpinia bracteosa</i> Tul.	catanga-de-porco	Phanerophyte
<i>Caesalpinia ferrea</i> Mart. ex Tul.	jucá/pau-ferro	Phanerophyte
<i>Chamaecrista eitenorum</i> (Irwin & Barneby) Irwin & Barneby	birro-preto	Phanerophyte
<i>Hymenaea stigonocarpa</i> Mart. ex Hayne	jatobá-de-vaqueiro	Phanerophyte
<i>Peltogyne confertiflora</i> (Hayne) Benth.	jatobazinho	Phanerophyte
<i>Poeppigia procera</i> Presl.	-	Phanerophyte
<i>Senna acuruensis</i> (Benth.) Irwin & Barneby	canafistinha	Phanerophyte
<i>Senna cearensis</i> A.Fern.	oca	Phanerophyte
<i>Senna spectabilis</i> var. <i>excelsa</i> (Schrad) Irwin & Barneby	-	Phanerophyte
<b>CAPPARACEAE</b>		
<i>Capparis hastata</i> L.	feijão-bravo	Phanerophyte
<i>Cleome guianensis</i> Aublet	-	Therophyte
<i>Crateva tapia</i> L.	trapiá	Phanerophyte
<b>COMBRETACEAE</b>		
<i>Combretum leprosum</i> Mart.	mofumbo	Phanerophyte
<i>Combretum mellifluum</i> Eichler	sipaubinha	Phanerophyte
<i>Terminalia actinophylla</i> Mart.	chapada	Phanerophyte
<i>Thilou glaucocarpa</i> (Mart.) Eichler	sipaúba-branca	Phanerophyte
<b>CONVOLVULACEAE</b>		
<i>Ipomoea brasiliiana</i> (Choisy) Meisn	cabacinha-braba	Liana
<i>Evolvulus</i> sp.	-	Hemicriptófito
<b>DIOSCORIACEAE</b>		
<i>Dioscorea glandulosa</i> Klotzsch ex Knuth	-	Camephyte
<b>ERYTHROXYLACEAE</b>		
<i>Erythroxylum laetevirens</i> O.E.Schulz	carocinho	Phanerophyte
<i>Erythroxylum subracemum</i> Turcz	carocinho	Phanerophyte
<b>EUPHORBIACEAE</b>		
<i>Croton celtifolius</i> Baill.	marmeleiro-preto	Phanerophyte
<i>Dalechampia affinis</i> Müll.Arg.	-	Liana
<i>Euphorbia comosa</i> Vell.	-	Camephyte
<i>Manihot anomala</i> Pohl	maniçoba-braba	Phanerophyte
<i>Sapium</i> cf. <i>obovatus</i> Kl.	mangaba	Phanerophyte
<b>FABACEAE</b>		
<i>Amburana cearensis</i> (Allemão) A.C.Sm.	imburana-de-cheiro	Phanerophyte
<i>Crotalaria holosericea</i> Nees & Mart.	modubim-brabo	Camephyte
<i>Dioclea grandiflora</i> Mart. ex Benth.	mucunã	Liana
<i>Galactia texana</i> A.Gray	-	Hemicriptófito
<i>Lonchocarpus araripensis</i> Benth.	amargoso	Phanerophyte
<i>Luetzelburgia auriculata</i> Ducke	pau-mocó	Phanerophyte
<i>Machaerium acutifolium</i> Vogel	coração-de-negro	Phanerophyte
<i>Macroptilium martii</i> (Benth.) Maréchal & Baudet	-	Liana
<i>Pterocarpus villosus</i> Mart. ex Benth.	-	Phanerophyte
<i>Swartzia fleemmingii</i> Raddi	jacarandá	Phanerophyte
<i>Vigna</i> cf. <i>penduncularis</i> Fawc. & Rendle	feijão-bravo	Liana
<b>LAMIACEAE</b>		
Indetermined	-	Therophyte
<b>LILIACEAE</b>		
<i>Alstroemeria piauhyensis</i> Gardner ex Baker	senhora-me-deixe	Geophyte
<i>Hippeastrum</i> aff. <i>solandriiflorum</i> Herb.	-	Geophyte
<i>Zephyranthes sylvatica</i> Baker	cebolinha	Geophyte
<b>LORANTHACEAE</b>		
<i>Strutantus</i> sp.	erva-de-passarinho	Parasite
<b>LYTHRACEAE</b>		

**TABLE 1.** List of species, common names, families, and their life-forms in Morro do Baixio, municipality of São José do Piauí, state of Piauí, Brazil. (Continued)

FAMILY/SPECIES	COMMON NAME	LIFE-FORM
<i>Cuphea ericoides</i> Cham. & Schlech.	-	Therophyte
<b>MALPIGHIACEAE</b>		
<i>Byrsonima correifolia</i> A.Juss.	murici	Phanerophyte
<i>Byrsonima lutea</i> (Griseb.) Cuatrec.	-	Liana
<i>Banisteriopsis stellaris</i> (Griseb.) B.Gates	enfeito-de-grinalda	Liana
<i>Barnebya harleyi</i> W.R.Anderson & B.Gates	murici-do-agreste	Phanerophyte
<i>Peixotoa jussieuana</i> A.Juss	flor-de-anjo	Phanerophyte
<i>Stigmatophyllon paralias</i> A.Juss.	-	Hemycryptophyte
<b>MALVACEAE</b>		
<i>Sida ulei</i> Ulbr.	malva-branca	Camephyte
<b>MIMOSACEAE</b>		
<i>Acacia piauiensis</i> Benth.	jurema	Phanerophyte
<i>Acacia</i> sp.	-	Phanerophyte
<i>Albizia polycephala</i> (Benth.) Killip	-	Phanerophyte
<i>Anadenanthera colubrina</i> var. <i>cebil</i> (Griseb.) Altschul	angico-preto	Phanerophyte
Indetermined	maracaípe	Phanerophyte
<i>Mimosa sensitiva</i> L.	-	Hemiciptófito
<i>Mimosa tenuiflora</i> (Willd.) Poir.	jurema-preta	Phanerophyte
<i>Piptadenia moniliformis</i> Benth.	mama-de-bezerra	Phanerophyte
<i>Piptadenia stipulaceae</i> (Benth.) Ducke	jurema-branca	Phanerophyte
<b>MYRTACEAE</b>		
<i>Eugenia</i> cf. <i>azuruensis</i> O.Berg.	goiaba-braba	Phanerophyte
<i>Eugenia flavescens</i> DC.	araçá-brabo	Phanerophyte
<i>Eugenia piauiensis</i> Berg.	araçá-de-pombo	Phanerophyte
<b>NYCTAGINACEAE</b>		
<i>Guapira</i> sp.	farinha-velha	Phanerophyte
<b>OLACACEAE</b>		
<i>Ximenia americana</i> L.	ameixa	Phanerophyte
<b>OPILIACEAE</b>		
<i>Agonandra brasiliensis</i> Miers	marfim	Phanerophyte
<b>PASSIFLORACEAE</b>		
<i>Passiflora cincinnata</i> Mast.	maracujá-do-mato	Liana
<i>Passiflora edmundoi</i> Sacco	-	Liana
<b>RHAMNACEAE</b>		
<i>Ziziphus cotinifolia</i> Reissek	juazeiro	Phanerophyte
<b>RUBIACEAE</b>		
<i>Alibertia edulis</i> (L.C.Rich.) A.Rich. ex DC.	marmelada	Phanerophyte
<i>Coutarea hexandra</i> (Jacq.) K.Schum.	quina-quina	Phanerophyte
<i>Richardia scabra</i> L.	ervancinha	Hemycryptophyte
<b>RUTACEAE</b>		
<i>Zanthoxylum rhoifolium</i> Lam.	laranjinha	Phanerophyte
<i>Zanthoxylum stelligerum</i> Turcz.	laranjinha	Phanerophyte
<b>SAPINDACEAE</b>		
<i>Cardiospermum corindum</i> L.	pustemeira	Liana
<i>Magonia pubescens</i> A.St.-Hil.	tingui	Phanerophyte
<i>Serjania caracasana</i> (Jacq.) Willd.	moita-de-cururu	Liana
<b>SCROPHULARIACEAE</b>		
<i>Angelonia</i> sp.	mãe-maria	Therophyte
<b>SOLANACEAE</b>		
<i>Capsicum parvifolium</i> Seudtn	alecrim-quebrado	Phanerophyte
<i>Solanum crinitum</i> Lam.	jurubeba	Phanerophyte
<i>Solanum</i> cf. <i>chytidoaudrum</i> Lam.	jurubeba-braba	Phanerophyte
<b>STERCULIACEAE</b>		
<i>Helicteres baruensis</i> Jacq.	guaxum	Phanerophyte
<i>Helicteres muscosa</i> Mart.	pimenta-de-mocó	Phanerophyte
<i>Waltheria</i> sp.	malva	Hemycryptophyte
<b>TURNERACEAE</b>		
<i>Turnera blanchetiana</i> Urb.	-	Phanerophyte
<b>VERBENACEAE</b>		
<i>Amasonia campestris</i> L.	flor-de-alma	Camephyte
<i>Lantana canescens</i> Kunth	alecrim-quebrado	Phanerophyte
<i>Vitex</i> sp.	pinho-brabo	Phanerophyte
Indetermined	-	Phanerophyte
<b>VITACEAE</b>		
<i>Cissus</i> sp.	-	Camephyte
<b>VOCHYSIACEAE</b>		
<i>Callisthene microphyla</i> Warm.	carocinho	Phanerophyte

**TABLE 2.** Results of  $\chi^2$  tests of Morro do Baixio, municipality of São José, and Raunkiaer's normal spectrum.

LIFE-FORM CLASS	%	%	$\chi^2$
	EXPECTED	OBSERVED	
Phanerophytes	46.00	78.95	23.60
Camephytes	9.00	6.01	0.99
Hemicryptophytes	26.00	8.27	12.09
Geophytes	6.00	3.76	0.84
Therophytes	13.00	3.01	7.68
<b>TOTAL</b>	<b>100.00</b>	<b>100.00</b>	<b>45.20</b>

**ACKNOWLEDGMENTS:** The authors would like to thank CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) for grants to the first author. Mundayatan Haridasan (Brasília University - UnB) made the English review. Mr. Martins, proprietor of the farm, for permission to conduct the field work and to taxonomists for the identification of the botanical specimens.

#### LITERATURE CITED

- Ab'Sáber, A.N. 1974. *O domínio morfoclimático semi-árido das Caatingas brasileiras*. São Paulo: Instituto de Geografia da USP. 37 p.
- Alcoforado-Filho, F.G., E.V.B. Sampaio and M.J.N. Rodal. 2003. Florística e fitossociológica de um remanescente de vegetação caducifólia espinhosa arbórea em Caruaru - Pernambuco. *Acta Botanica Brasileira* 17(2): 287-303.
- Araújo, F.S. and F.R. Martins. 1999. Fisionomia e organização da vegetação do carrasco no Planalto da Ibiapaba, estado do Ceará. *Acta Botanica Brasileira* 13(1): 1-14.
- Araújo, F.S., R.C. Costa, M.A. Figueiredo and E.P. Nunes. 2005. Vegetação e flora da área Reserva Serra das Almas, Ceará; p. 91-119 In: F.S. Araújo, M.J.N. Rodal and M.R.V. Barbosa (ed.). *Análise das variações da biodiversidade do bioma Caatinga: suporte a estratégias regionais de conservação*. Brasília: Ministério do Meio Ambiente.
- Araújo, E.L., V.S.B. Sampaio and M.J.N. Rodal. 1995. Composição florística e fitossociológica de três áreas de Caatinga de Pernambuco. *Revista Brasileira de Biologia* 55(4): 595-607.
- Araújo, F.S., V.S.B. Sampaio, M.A. Figueiredo, M.J.N. Rodal and A.G. Fernandes. 1998. Composição florística da vegetação de carrasco, Novo Oriente, CE. *Revista Brasileira de Botânica* 21(2): 105-116.
- Batalha, M.A. and F.R. Martins. 2004. Floristic, frequency, and vegetation life-form spectra of a cerrado site. *Brazilian Journal of Biology* 64(2): 203-209
- Cain, S.A. 1950. Life forms and Phytoclimate. *Botanica Review* 16: 1-32.
- Castro, A.A.J.F., F.R. Martins and A.G. Fernandes. 1998. The woody flora of cerrado vegetation in the state of Piauí, Northeastern Brazil. *Edinburgh Journal of Botany* 55(3): 455-472.
- Costa, R.C., F.S. Araújo and L.W. Limaverde. 2007. Flora and Life-Form Spectrum in an area of deciduous thorn woodland (Caatinga) in northeastern, Brazil. *Journal of Arid Environments* 68: 237-247.
- Cronquist, A. 1988. *The evolution and classification of flowering plants*. 2ed. New York: The New York Botanical Garden. 555 p.
- Engler, W.A. 1951. Contribuição ao estudo da Caatinga pernambucana. *Revista Brasileira de Geografia* 13(4): 65-77.
- Farias, R.R.S. and A.A.J.F. Castro. 2004. Fitossociologia de trechos da vegetação do Complexo de Campo Maior, Campo Maior, PI, Brasil. *Acta Botanica Brasileira* 18(4): 949-963.
- Ferraz, E.M.N., M.J.N. Rodal, E.S.B. Sampaio and R.C.A. Pereira. 1998. Composição florística em trechos de vegetação de Caatinga e brejo de altitude na região do Vale do Pajeú, Pernambuco. *Revista Brasileira de Botânica* 21(1): 7-15.
- Figueirêdo, L.S., M.J.N. Rodal and A.L. Melo. 2000. Florística e fitossociologia de uma área de vegetação arbustiva caducifólia no município de Buíque-Pernambuco. *Naturalia* 25: 205-224.
- Giulietti, A.M., R.M. Harley, L.P. Queiroz, M.R.V. Barbosa, A.L. Bocage-Neta and M.A. Figueiredo. 2002. Espécies endêmicas da Caatinga; p. 103-118. In: E.V.S.B. Sampaio, A.M. Giulietti, J. Virgínio and C.F.L. Gamarrá-Rojas (ed.). *Vegetação & Flora da Caatinga*. Recife: Associação de Plantas do Nordeste - APNE.
- Hueck, K. 1972. *As florestas da América do Sul: Ecologia, Composição e Importância Econômica*. São Paulo: Universidade de Brasília/ Polígono. 446 p.
- Jacomin, P.K.T., A.C. Cavalcanti, S.C.P. Pessoa, N. Burgos, H.F.R. Melo Filho, O.F. Lopes and L.A.R., Medeiros. 1986. *Levantamento Exploratório de Solos do Estado do Piauí (escala 1:1000)*. Rio de Janeiro: EMBRAPA/SUDENE-DNR. 782 p.
- Kampen, J. 1979. *Farming system research and technology; semi arid tropics*. Hyderabad: ICRISAT. 39p.
- Lemos, J.R. 2004. Composição florística do Parque Nacional Serra da Capivara, Piauí, Brasil. *Rodriguesia* 55 (85): 55-66.
- Lemos, J.R. and M.J.N. Rodal. 2002. Fitossociologia do componente lenhoso de um trecho de vegetação arbustiva espinhosa no Parque Nacional Serra da Capivara, Piauí, Brasil. *Acta Botanica Brasílica* 16 (1): 23-42.
- Luetzelburg, P.Von. 1923. *Estudo Botânico do Nordeste*. Rio de Janeiro: IFOCS Publicações. 243p.
- Mueller-Dombois, D. and H. Ellenberg. 1974. *Aims and methods of vegetation ecology*. New York: John Wiley & Sons. 546p.
- Oliveira, M.E.A., E.V.S.B. Sampaio, A.A.J.F. Castro and M.J.N. Rodal. 1997. Flora e fitossociologia de uma área de transição carrasco-Caatinga de areia em Padre Marcos, Piauí. *Naturalia* 22: 131-150.
- Queiroz, L.P. 2002. Distribuição das espécies de Leguminosae na Caatinga; p. 141-153. In: E.V.S.B. Sampaio, A.M. Giulietti, J. Virgínio and C.F.L. Gamarrá-Rojas (ed.). *Vegetação & Flora da Caatinga*. Recife: Associação de Plantas do Nordeste - APNE.
- Ramos, V.M. and M.C.L. Sales. 2001. Análise da capacidade de uso da terra, com base na declividade e nas características dos solos, nas áreas sob influência do reservatório de Bocaina-PI. *Carta CEPRO* 20: 34-46.
- Raunkiaer, C. 1934. *The Live Forms of Plants and Statistical Plant Geography*. Oxford: Clarendon Press. 632 p.
- Reis, A.C. 1976. Clima da Caatinga. *Anais da Academia Brasileira de Ciências* 48(2): 325-335.
- Ribeiro, L.F. and M. Tabarelli. 2002. A structural gradient in cerrado vegetation of Brazil: changes in woody plant density, species richness, life history and plant composition. *Journal of Tropical Ecology* 18: 75-794.
- Rivas, M.P. 1996. *Macrozoneamento geoambiental da bacia hidrográfica do rio Parnaíba*. Rio de Janeiro: IBGE, Série Estudos e Pesquisas em Geociências 4. 110 p.
- Rodal, M.J.N., F.R. Martins and E.V.S.B. Sampaio. 2008. Levantamento quantitativo das plantas lenhosas em trechos de vegetação de Caatinga em Pernambuco. *Revista Caatinga* 21(3): 192-205.
- Rodal, M.J.N., A.C.B. Lins-E-Silva, A.D.C. Cavalcanti and L.P. Maranhão. 2005. Vegetação e flora fanerogâmica da área de Betânea, Pernambuco; p. 141-168. In: F.S. Araújo, M.J.N. Rodal and M.R.V. Barbosa (ed.). *Análise das Variações da Biodiversidade do Bioma Caatinga: suporte a estratégias regionais de conservação*. Brasília: Ministério do Meio Ambiente.
- Rodal, M.J.N., K.V.S.A. Andrade, M.F. Sales and A.P.S. Gomes. 1998. Fitossociologia do componente lenhoso de um refúgio vegetacional no município de Buíque, Pernambuco. *Revista Brasileira de Biologia* 58(3): 517-526.
- Rodal, M.J.N., L.M. Nascimento and A.L. Melo. 1999. Composição florística de um trecho de vegetação arbustivo caducifólia, no município de Ibirimim, PE, Brasil. *Acta Botanica Brasileira* 13(1): 15-28.
- Sampaio, E.V.S.B. 2002. Uso das plantas da Caatinga; p. 49-90 In: E.V.S.B. Sampaio, A.M. Giulietti, J. Virgínio and C.F.L. Gamarrá-Rojas (ed.). *Vegetação & Flora da Caatinga*. Recife: Associação de Plantas do Nordeste - APNE.
- Silva, J.M.C., M. Tabarelli and M.T. Fonseca. 2004. Áreas e ações prioritárias para a conservação da biodiversidade na Caatinga; p. 349-347 In: J.M.C. Silva, M. Tabarelli, M.T. Fonseca and L.V. Lins (ed.). *Biodiversidade da Caatinga: áreas e ações prioritárias para a conservação*. Brasília: Ministério do Meio Ambiente.
- Taylor, N.P. and D. Zappi. 2002. Distribuição de espécies de Cactaceae na Caatinga; p.123-125 In: E.V.S.B. Sampaio, A.M. Giulietti, J. Virgínio and C.F.L. Gamarrá-Rojas (ed.). *Vegetação & Flora da Caatinga*. Recife: Associação de Plantas do Nordeste - APNE.
- Thorntwaite, C.W. and J.R. Mather. 1955. The water balance. *Publication in Climatology* 8(1): 1-104.
- Veloso, H.P., A.L.R. Rangel-Filho and J.C.A. Lima. 1991. *Classificação da vegetação brasileira, adaptada a um sistema universal*. Rio de Janeiro: IBGE. 123 p.
- Whittaker, R.A. 1975. *Communities and Ecosystems*. New York: Macmillan Publishing. 385 p.
- Zar, J.H. 1999. *Biostatistical Analysis*. New Jersey: Prentice Hall. 663 p.

RECEIVED: November 2009

REVISED: January 2010

ACCEPTED: January 2010

PUBLISHED ONLINE: February 2010

EDITORIAL RESPONSIBILITY: Angelo Gilberto Manzatto