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# Flora and life-form spectrum in an area of deciduous thorn woodland (caatinga) in northeastern, Brazil

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**Abstract**

Caatinga, a deciduous thorny woodland vegetation, is encountered in the semi-arid region of northeastern Brazil. In view of the importance of the herbaceous component of caatinga plant communities, a characterization of the flora of the Não Me Deixes Reserve in Ceará State, Brazil (4°49′34″S, 38°59′09″W, at 210 m a.s.l.) was undertaken. The reserve has 300 ha of caatinga vegetation, including dense tree steppe and open tree steppe. The mean annual rainfall is 732.8 mm, concentrated between February and May (78%). The flora was surveyed at monthly intervals between February 2000 and June 2001. We encountered 133 species belonging to 47 families. The herbaceous/woody ratio was 1.4. Based on field observations, the life-form spectrum was characterized according Raunkiaer's system, and compared with his normal spectrum. The life-form spectrum observed was: therophytes (42.9%), phanerophytes (26.3%), camaephytes (15.8%), hemicryptophytes (12.8%), and cryptophytes (2.3%). Previous data on the caatinga herbaceous flora, as well as the present study, indicate that the floristic richness of this biome has been underestimated, and that the herbaceous/woody proportion varies according to its physiognomy and water status.


*Keywords:* Deciduous woodland; Caatinga; Semi-arid region; Life-form spectrum

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## 1. Introduction

The Brazilian northeastern region covers 1,542,246 km$^2$ (IBGE, 1998). Of this area, 750,000 km$^2$ has a semi-arid climate (Ab'Saber, 1977) corresponding to Koeppen's BSh climatic type (Andrade-Lima, 1981). This semi-arid region demonstrates varying degrees of edapho-climatic aridity, generally associated with its distance to the Atlantic coast, altitude, geomorphology, degree of dissection of the landscape, slope, wind exposure, as well as soil depth and its physical and chemical composition. Rainfall usually totals less than 750 mm/year in most of this domain, and it is concentrated in three consecutive months during the southern hemisphere summer or summer/autumn (November until June). Temperatures vary little, with an annual average of approximately 26 °C (Nimer, 1989). The seasonal xerophilous thorn woodland/shrubland, regionally denominated caatinga, prevails in the semi-arid lowlands on an extensive regional crystalline basement complex (Andrade-Lima, 1981; Sampaio, 1995). The term caatinga refers to xerophytic, woody, thorny, and deciduous physiognomies with a seasonal herbaceous layer (Veloso et al., 1991). It comprises a mosaic of vegetation types varying from dry thorn forest to open shrubby vegetation (Andrade-Lima, 1981). These variations have been attributed to large-scale variations in the climate, orographic patterns, and small-scale variations in topography and soils (Andrade-Lima, 1981; Sampaio, 1995). Although many authors have stressed the importance of herbaceous species within caatinga physiognomies (Veloso et al., 1991; Sampaio, 1995; Rizzini, 1997), most floristic and phytosociological studies have focused only the woody component (Tavares et al., 1969a, b, 1970, 1974; Gomes, 1980; Figueiredo, 1987; Fonseca, 1991; Rodal, 1992; Araújo et al., 1995; Lima and Lima, 1998; Camacho, 2001; Lemos and Rodal, 2002; Pereira et al., 2002; Alcoforado-Filho et al., 2003; Nascimento et al., 2003). Few studies have been devoted to the structure and flora of the herbaceous layer in plant communities of caatinga (Figueiredo, 1983; Santos, 1987; Oliveira et al., 1988; Oliveira, 1995; Ferraz et al., 1998).

Plant species and individuals can be grouped into different life-form classes based on structural and functional similarities (Mueller-Dombois and Ellenberg, 1974). Life-forms have close relationships with environmental factors (Mueller-Dombois and Ellenberg, 1974) and can be viewed as strategies for obtaining resources (Crosswhite and Crosswhite, 1984; Cody, 1986). Raunkiaer (1934) proposed a life-form classification system based on the manner in which plants protect their perennating buds during unfavourable seasons. According to this classification system, plant species can be grouped into five main classes: phanerophytes, camaephytes, hemicryptophytes, cryptophytes, and therophytes. This sequence corresponds to an increasing protection of the perennating buds.

Climatic types can be characterized by the prevailing life-forms in plant communities growing under a given climatic regime, using the proportions of species in each life-form class, or the biological spectrum (Raunkiaer, 1934; Cain, 1950; Mueller-Dombois and Ellenberg, 1974). Studies carried out in arid and semi-arid areas have shown that there is a high proportion of life-forms that lose their aerial shoots during the driest months (therophytes, hemicryptophytes, and cryptophytes) (van Rooyen et al., 1990). The importance of therophytes increases as rainfall decreases and becomes more irregular (Raunkiaer, 1934; Kovács-Lang et al., 2000).

Few studies have shown high herbaceous species richness in areas of caatinga (Silva, 1985; Santos, 1987). In these studies, species were classified subjectively according to their growth habit, without precisely stating their life-form. In the present study, we used