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Richness and ethnobotany of the family Euphorbiaceae in a tropical semiarid landscape of Northeastern Brazil

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ABSTRACT

Euphorbiaceae stands out among angiosperms in its species richness and in the number of reported uses from ethnobotanical surveys in Brazil and other tropical countries. In Brazilian semiarid regions, species of Euphorbiaceae are among the most frequently used by rural communities, especially for medicinal purposes. The present study investigated the presence of species of Euphorbiaceae and their use by a rural population from the Araripe National Forest region, a protected area located in the Chapada do Araripe (NE Brazil). This area is considered to be of primary importance for conservation, and it is lacking in scientific research. The survey of the richness of Euphorbiaceae occurred through opportunistic plant collections and phytosociological studies between August 2011 and June 2012. We performed 153 interviews with informants who were selected based on general non-probabilistic household sampling and administered semi-structured interviews using a checklist interview that considered all the species of the family Euphorbiaceae registered in collections. We found 23 species of Euphorbiaceae, with the genus *Croton* (5 species) being highlighted. This study adds new occurrences of Euphorbiaceae to the region compared with the results found in previous surveys; 50% of the collected Euphorbiaceae species were considered useful, with *Manihot esculenta* (cassava) considered of the highest importance, with a higher utilization rate in the community ponds. The study also indicated the use of castor bean (*Ricinus communis*), *Croton heliotropiifolius*, and *Jatropha gossypiifolia*. The category of use that was most cited was medicinal, and most of the useful species were obtained by informants in anthropogenic areas. The richness of Euphorbiaceae in the region was representative; however, further studies should be conducted in the study area. The dynamics of Euphorbiaceae use in the studied rural population did not appear to pose a threat to native species within the conservation area.

1. Introduction

The Brazilian semiarid region is home to a significant amount of biodiversity that is associated with cultural diversity; however, this region is still poorly studied (Albuquerque et al., 2007). The significant cultural diversity of this region results from a confluence of different cultures and populations that have different uses for the available plants. Therefore, records of the cultural diversity from ethnobotanical studies are important tools for the development of realistic and functional models for the use and management of natural resources, which can assist public policy planning and decision-making (Albuquerque et al., 2009).

In recent years, ethnobotanical studies performed in the Brazilian semiarid region have indicated that the families Fabaceae (Caesalpiniaceae and Mimosaceae), Lamiaceae, Asteraceae, and Euphorbiaceae are the most representative in terms of use (Albuquerque et al., 2007; Albuquerque and Andrade, 2002a; Nascimento et al., 2009; Cartaxo et al., 2010; Melo et al., 2009). In these studies, Euphorbiaceae was of particular interest because it includes several useful species spanning different use categories, particularly the genera *Croton* L., *Euphorbia* L., and *Jatropha* L. The medicinal use category is the most representative for the species of this family, although other cited uses are as timber and food as well as for mystical purposes, among others (Albuquerque et al., 2007; Almeida et al., 2005, 2010; Nascimento et al., 2009; Oliveira et al., 2007; Agra et al., 2007).

Stauble (1986) reviewed the botanical knowledge related to Euphorbiaceae in rural communities in Western Africa and described 81 species that can be useful for 87 symptoms; of these species, 46% may have purgative effects, and 28% may have antidiarrheal effects. The author stated that certain genera, such as *Euphorbia*, *Phyllanthus*, and *Jatropha*, have several medicinal species and emphasized the ethnopharmacological importance of the family. The use of Euphorbiaceae was also evaluated by studies in India (Kumari and Sinha, 2011; Kumar and Chaturvedi, 2010), where the medicinal use of 23 species belonging to 12 genera was described. In these studies, certain species were considered capable of treating symptoms of incurable diseases, such as AIDS and cancer.

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Euphorbiaceae is one of the most complex and diversified families of the order Malpighiales and shows a highly diverse morphology, including generally lactescent plants (Oliveira et al., 2007; Sátiro and Roque, 2008; Lucena, 2009). The species of this family are often cited as pioneers and frequently occupy rocky outcrops, ruderal environments, disturbed areas, and forest and road edges (Lucena and Alves, 2010; Alves, 1999; Santos and Sales, 2009; Silva et al., 2010; Araújo et al., 2010).

In the Araripe National Forest, 11 species of Euphorbiaceae have been recorded (Ribeiro et al., 2012; Costa et al., 2004); however, studies have not been performed that specifically evaluated the set of species of this family in the region. Therefore, the aim of this study was to identify the Euphorbiaceae species available to a rural community surrounding the Araripe National Forest and record the knowledge of the uses of these species. From this basis, we aimed to identify the most important species and most cited use categories by one of the human populations, showing the distribution of this family in the region.

2. Methods

2.1. Study site

The Araripe National Forest is a conservation unit for the sustainable use of forest resources and scientific research (ICMBio); it has approximately 38 thousand hectares, is located in the south of the state of Ceará within the Chapada do Araripe Environmental Protection Area, and covers part of the municipalities of Crato, Barbalha, and Jardim. This conservation unit is the first National Forest in Brazil, and it was established to preserve the forest resources to maintain the springs that feed the valleys. The Chapada do Araripe Environmental Protection Area exhibits deep and well-drained soils in addition to a good aquifer and protective plant cover, which guarantees the maintenance of a wet and fertile region in its surroundings, mainly in the portion facing Ceará (Alencar et al., 2007). The vegetation of the Araripe National Forest, according to the unit's management plan, consists of physiognomies of the Cerrado biome, such as Cerrado *stricto sensu* (ss) (= woody savanna; 42.67%) and "Cerradão" (= savanna woodland; 37.32%), and areas of mountain rainforest (12.34%) and "Carrasco" (a xerophytic vegetation subtype; 6.67%), in addition to a low representation of secondary forests (0.07%) and areas without forest cover (0.98%) (Veloso et al., 1991; Austregésilo-Filho eta al., 2001).

In the definition of Coutinho (1978), the Cerrado shows two extreme physiognomies, "Cerradão" and "campo limpo" (open grassland), and all the remaining physiognomies of this biome are considered ecotones between these extremes. In the Araripe National Forest, Lima et al. (1984) characterized the Cerrado area as a transition between the rainforest and the Cerrado that consists of sparse woody vegetation of medium size with widely branched elements and soil covered by grasses. The "Cerradão" is differentiated from the Cerrado by a forest physiognomy with small- and medium-sized tortuous trees, a dense shrub understory, and soil that is uncovered or covered by a thin layer of grasses.

The rainforest of the Araripe National Forest is characterized by medium-sized woody vegetation, and some elements reach heights between 11 and 15 meters with straight shafts, tall branches, and understories composed of natural regeneration of the overstory. In surveys performed for the development of the management plan, the rainforest showed great similarity to the "Cerradão" in terms of tree species. The "Carrasco" was defined by Andrade-Lima (1978) as a xerophytic vegetation type of small-sized subtree and tree physiognomy. Lima et al. (1984) characterized the "Carrasco" of the Araripe National Forest as xeromorphic shrub vegetation with a severely leached sandy soil and deciduous species that reach a maximum height of 5 m. The Carrasco consists of Cerrado, "Cerradão," forest, and Caatinga species and is considered by Fernandes (1990) and Fernandes and Bezerra (1990) to have originated from the destruction of the "Cerradão," assuming an aspect of dense shrubbery forest.

The Araripe National Forest has species typical of the Cerrado plant physiognomies (Ribeiro-Silva et al., 2012) and includes the only protected Cerrado area in the state of Ceará; therefore, it is considered by the Ministry of Environment to be of priority importance for conservation and scientific research (Costa and Araújo, 2006). The study site is of great ecological importance because the Chapada do Araripe is among the 27 sites classified as of extreme biological importance, and it is a priority for the conservation of biodiversity in the Caatinga (Tabarelli and Silva, 2002). Anthropic areas span 84% of the territory of Ceará, and the climate and soil conditions of this region favor desertification. In this context, the Araripe National Forest plays an important role in the preservation of fauna, flora, and water and provides a balance for the regional climate by protecting and supporting the existing forests. Additionally, this conservation unit provides several resources, such as food, energy, and medicinal plants, to the rural populations settled in the area.

2.2. Studied community

This study was conducted in the rural community of Horizonte (also known as Cacimbas), which is adjacent to the Araripe National Forest and is located in the municipality of Jardim (S 07° 29′ 36.9″, W 39° 22′ 02.6″), Ceará State, in the northeast region of Brazil.

According to the census performed by local health agents, approximately 1120 people live in the community, and there is an outflow of people searching for jobs in other states because of the lack of opportunities in the region. Located approximately 15 km from the urban center of Jardim, Cacimbas has one health center for simple, weekly care, and urgent care is available in the city center. The community also has a daycare center and a primary school, whereas secondary education is available in the urban center. The rate of illiteracy is 15% and mostly corresponds to elderly residents.

Because of the lack of employment opportunities, extractivism contributes to the income generated by this community. The most extracted products are "pequi" (*Caryocar coriaceum* Wittm.), "janaguba" (*Himatanthus drasticus* (Mart.) Plumel), "faveira" (*Dimorphandra gardneriana* Tul.), and "barbatimão" (*Stryphnodendron* sp.), and several species are used as firewood and in honey harvesting. Most of the inhabitants practice subsistence agriculture and primarily cultivate beans and cassava, selling the excess product. In addition to extractivism, the main source of income for this population is government aid (the Bolsa Família [Family Grant] and Bolsa Escola [School Grant] programs).

2.3. Floristic survey of the family Euphorbiaceae

A preliminary survey of the species of Euphorbiaceae that occur in the study site was performed by consulting specialized literature, the Dárdano de Andrade-Lima Herbarium of the Cariri Regional University (Universidade Regional do Cariri - URCA), the Professor Vasconcelos Sobrinho Herbarium (Herbário Professor Vasconcelos Sobrinho – PEUFR) of the Department of Biology of the Federal Rural University of Pernambuco (Universidade Federal Rural de Pernambuco – UFRPE), and the website *specieslink* (http://splink.cria.org.br/). Subsequently, the collection was performed between August 2011 and July 2012. To determine the availability of Euphorbiaceae species, several walks were conducted through the different physiognomies of the Araripe National Forest, including inner areas, trails, edges, and areas close to the studied community. A field guide with images and the popular names of plants that occur in the region was created based on the literature to assist in locating the species with the aid of a *mateiro* (a local inhabitant with knowledge of the plant biodiversity), who participated in the walks whenever possible. All the observed Euphorbiaceae individuals,