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Do socioeconomic characteristics explain the knowledge and use of native food plants in semiarid environments in Northeastern Brazil?

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ABSTRACT

For decades, native food resources have been the only food source available to rural communities. However, because of increasing access to exotic food plants and industrial products, the current status of the knowledge and use of native species is uncertain. Accordingly, the objectives of our study were to assess whether extractive communities living in proximity to a protected area used their entire repertoire of known native food species and whether socioeconomic characteristics (gender, age, occupation, educational level and duration of residence) influenced the knowledge and use of these species. The three selected communities are highly dependent on forest resources; however, they display distinct collection strategies. We found that there is a strong correlation between the knowledge and use of native food species in the three studied communities. This result differs from the results of similar studies that have correlated these two variables and indicated that people generally have a greater knowledge of resources than they actually use. However, when we compared the knowledge and use of native food species among the three communities, we found that people in the community in which species are collected mainly from home gardens knew and used significantly fewer species than people in the other communities. The duration of residence and age were the variables that most explained the knowledge and use of native food species, although the explanatory power was low. Our results allow us to conclude that socioeconomic characteristics affect the knowledge and use of native food plants. However, it was not possible to identify a pattern of influence of these variables in the communities. Only in communities that have conservation areas as their main collection sites did age influence the knowledge and use of species. Additionally, our results allow us to infer that the collection strategy adopted by each community is an important characteristic that influences both the knowledge and use of native food species.

1. Introduction

Various plant resources are used by human communities worldwide to meet the basic needs of their families (Maharjani and Chettri, 2006; Nascimento et al., 2012). Among these resources, native food plants are important supplements to diets and have been the target of several studies that have focused on identifying patterns related to the knowledge and use of local and traditional communities (Arias-Toledo et al., 2007; Ladio and Lozada, 2004; Ghirardini et al., 2007; Nascimento et al., 2012). In this work, we consider those native food plants collected in forest environments (Guinand and Lemessa, 2001).

Several authors have emphasized the importance of distinguishing between knowledge and use because a species can be known but not necessarily used (Reyes-Garcia et al., 2005; Ramos et al., 2008; Sá and Silva et al., 2009). This distinction becomes important because it contributes to the understanding of issues that interfere with local knowledge (Ladio and Lozada, 2004) and assists in determining whether knowledge and use of the species

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are correlated or not (Reyes-Garcia et al., 2005).

Among many aspects that can influence the knowledge and use of native food species are gender, age, educational level, profession (Ayantunde et al., 2008; Ladio and Lozada, 2004; Reyes-Garcia et al., 2005; Arias-Toledo et al., 2007; Nascimento et al., 2012) and distance from urban centers as well as the cultural issues inherent in local communities and influence of increased agricultural activities (Ladio and Lozada, 2003; Ali-Shtayeh et al., 2008). Several studies on native food plants have stressed that knowledge is concentrated among elders and men and women know and use the same amount of native species, although the number of species mentioned by men is greater (Arias-Toledo et al., 2007; Nascimento et al., 2012). Ladio and Lozada (2004) investigated differences in knowledge and use in different environments where the plants are found and discovered different patterns of knowledge and use of species. These authors found that in the most conserved environments in Patagonia, virtually all of the edible species were used by Mapuche communities. The type of activity undertaken by the communities can also influence the knowledge and use of native food plants, and people who develop agriculture-related activities know more species than those who specialize in other activities (Arias-Toledo et al., 2007).

In addition to these socioeconomic factors, ecological aspects also affect both the knowledge and use of resources. Among such aspects are richness, availability, accessibility, abundance and the ecological importance of natural resources (Arias-Toledo et al., 2009; Ghorbani et al., 2012; Guéze et al., 2014). Certain authors have found that the knowledge and use of resources increases with the number of species in a particular environment and that the ease of collection may also affect the use of native species (Ladio and Lozada, 2004; Ghorbani et al., 2012). Gueze et al. (2014) suggests that most species of ecological significance are also frequently used by certain communities. Currently, there are conflicting reports regarding the influence of socioeconomic characteristics on the knowledge and use of food plants in mega-diverse countries such as Brazil, because a gap exists regarding the factors that influence the knowledge and use of these resources despite significant advances in ethnobotanical studies. Only two studies on the subject in Brazil have been published, and both studies occurred in the Caatinga (semi-arid) biome. The studies found that only age significantly influences the number of plants mentioned (Nascimento et al., 2012; Cruz et al., 2013, 2014) and that men consume more native species than women because they are primarily responsible for the collection of native resources (Cruz et al., 2013). In this study, unlike the previous study mentioned, we evaluated the influence of socioeconomic variables on the knowledge and use in communities that have a high dependence on plant resources and that present a Unit of Conservation and Sustainable Use (U.C),[1] that are localized in the vicinity of the communities where they live. The results of this work may help to understand which factors influence the dynamics of knowledge and use of native plants.

Thus, in the present study, we assume the existence of different patterns of knowledge and use of native food species and tests the hypothesis that gender, age, education level, duration of residence and occupation influence the richness of known and used native food species. Specifically, this study aimed to answer the following questions: (*1*) Are there differences in the richness of known and used native food species among local communities that have different socioeconomic backgrounds? (*2*) Do gender, age and extractivism influence the knowledge and use of native food species? (*3*) Do age, duration of residence and educational level explain the number of species known and used by communities?

2. Materials and methods

2.1. Study areas

Fieldwork was conducted in three extractive communities near the Araripe National Forest (*Floresta Nacional do Araripe*, hereafter FLONA-Araripe) and Araripe Environmental Protection Area (*Área de Proteção Ambiental do Araripe*, hereafter APA-Araripe), which are protected areas located in the Araripe Plateau in the northeast region of Brazil. The three communities belong to different towns and have different strategies for collecting natural resources, but they are all situated in similar ecological zones and have the same plant resources in the areas of collection at their disposal.

The Araripe Plateau encompasses an area of 38,493.00 ha (IBAMA, 2004) at the following coordinates: latitude 07°11′42 S and longitude 39°13′28 W (Ribeiro-Silva et al., 2012). The climate in this region is mild warm tropical semiarid and warm tropical subhumid with mean annual rainfall of 1090.90 mm, mean temperature of 24–26 °C and a rainy season lasting from January to May (IPECE, 2004). The phytophysiognomy of the region is formed by different vegetation types, such as Cerrado (*sensu stricto*) and tall Cerrado (Ribeiro and Walter, 2008), Carrasco (a type of xerophytic vegetation) and semideciduous forest (IBAMA, 2004).

Both the APA-Araripe and FLONA-Araripe play important roles in the livelihoods of families living in the surrounding communities. This region generates attention because of its cultural richness that is demonstrated through crafts, religious festivals, use of home remedies, and extraction and sale of non-timber forest products (NTFPs) (IBAMA, 2004). The present study was conducted between the months of October 2012 and June 2013.

The three extractive communities selected (Baixa do Maracujá, Horizonte, and Macaúba) (Fig. 1) have distinct histories both for the species that are extracted and sites where resources are obtained. These communities present an interesting scenario for conducting ethnobiological studies because they have a close relationship with the extraction of NTFPs and are highly dependent on these resources for their livelihood (IBAMA, 2004). The selected communities are well-organized socially and include consolidated neighborhood associations and extractive associations. Table 1 presents information on the variables that were categorized for the analyses. The variables educational level and duration of residence were not categorized, so they are not presented in the table. It is worth mentioning that the average level of education of the Baixa do Maracujá informants was five years, with a range from zero to 11 years, and the average duration of residence was 31 years, with a range from 1 to 81 years. In Horizonte, the informants' education level was 3.6 years on average, with a range from zero to 15 years, and the average duration of residence was 42 years, with a range from four to 90 years. In Macaúba, the average level of education was 4.9 years, with a range from zero to 11 years, and the average duration of residence was 49.42 years, with a range from four to 87 years.

Of the three studied communities, Horizonte, which is located 13 km from Jardim – Ceará, the nearest municipality, was the most economically dependent on the proceeds from products extracted from the FLONA-Araripe. The most exploited NTFP was *Caryocar coriaceum* Wittm (known locally and referred to hereafter as *pequi*), which provided the greatest source of income for families during harvest season (IBAMA, 2004). In addition to the sale of raw fruits, the sale of oil extracted from *pequi* guarantees the families an extra source of income, especially during the off season (Sousa-Júnior

[1] Unit Conservation and Sustainable Use: forest cover area with predominantly native species and has as primary objective the sustainable multiple use of forest resources and scientific research, with emphasis on methods for sustainable use of native forests (IBAMA, 2007).