



## The ecological apparency hypothesis and the importance of useful plants in rural communities from Northeastern Brazil: An assessment based on use value

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### ABSTRACT

The ecological apparency hypothesis in ethnobotanical studies predicts that the apparent plants (i.e., the most easily found in the vegetation) would be the most commonly collected and used by people. To test this hypothesis, it has been used the concept of use value (VU), which measures the relative importance of useful plants for a group of people. However, the use value has got some limitations, including the fact that it does not distinguish “current use” (plants which are effectively used) from “potential use” (well known plants, however not used). Therefore, this study has tested whether the obtained results through three different use value calculations could be useful in testing the ecological apparency hypothesis. These calculations have included the current use value, the potential use value, and the general use value. It has been carried out a vegetation survey and an interview for residents from the rural communities from Barrocas and Cachoeira (Soledade, Paraíba, Brazil). It has been used Spearman's coefficient to correlate phytosociological and ethnobotanical data. It has been observed that phytosociological parameters in Cachoeira were not correlated with any of the use values calculations, except the relationship between the current use value and the relative dominance ( $r_s = 0.57$ ;  $p < 0.05$ ). In Barrocas, every use value calculation was correlated with the basal area and the relative dominance. When each category of use is analyzed separately, it has been observed that there was no correlation between the use value and the phytosociological parameters, except for the construction category, in which the current use value in Cachoeira was correlated with the relative dominance ( $r_s = 0.63$ ;  $p < 0.05$ ), importance value ( $r_s = 0.67$ ;  $p < 0.01$ ), relative frequency ( $r_s = 0.71$ ;  $p < 0.05$ ), and relative density ( $r_s = 0.72$ ;  $p < 0.01$ ). In Barrocas, the UVc for the construction category was correlated with relative frequency ( $r_s = 0.69$ ;  $p < 0.05$ ) and relative density ( $r_s = 0.66$ ;  $p < 0.01$ ). These results have suggested that, the use value calculation, which takes into consideration just the current use of the species, is the one that best fits in the ecological apparency hypothesis.

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### 1. Introduction

In recent decade, ethnobotanical studies have analyzed the dynamics of people–plant relationships under different perspectives (Luoga et al., 2000; La Torre-Cuadros and Islebe, 2003; Shanley and Rosa, 2004; Hanazaki et al., 2006; Lucena et al., 2007, 2008; Reyes-García et al., 2007; Lucena et al., 2008; Ramos et al., 2008a, 2008b). Thenceforth, several ecological hypotheses about

the dynamics of foraging have stimulated the development of ethnobotanical studies, aiming to explain the use of plant resources in local communities. Among these hypotheses, it has been highlighted the ecological apparency hypothesis initially proposed by Feeny (1976) and Rhoades and Cates (1976), and first implemented in herbivory studies.

The ecological apparency hypothesis has proposed that there are two classes of plants: apparent and non-apparent, according to their availability to herbivores. Apparent plants are those easily visible due their size (trees, shrubs, and large herbs) or life cycle characteristics; non-apparent plants are small herbaceous plants of early successional stages (Albuquerque and Lucena, 2005).

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Following the offer-demand principle, Phillips and Gentry (1993a, 1993b) have adapted this hypothesis for ethnobotanical studies, drawing a parallel between foraging animals and human populations. This way, apparent plants would be major targets for collection and use by humans (Albuquerque and Lucena, 2005; Lucena et al., 2008). To test this adapted hypothesis, Phillips and Gentry (1993a, 1993b) have developed a quantitative measure, the use value (VU) that attempts to measure the relative importance of given species to a human population based on their report about their use. According to the hypothesis, the most available species in woodlands would tend to have higher use value, being this relationship directly proportional, in other words, the higher the availability, the higher the use value of a plant.

After testing (La Torre-Cuadros and Islebe, 2003; Cunha and Albuquerque, 2006; Lucena et al., 2007; Ayantude et al., 2009), some limitations of the use value measure became apparent, mainly because the fact that it does not distinguish “the current use” (plants which are effectively used) from “potential use” (well known useful plants, however which are not used at all). This lack of distinction between current and potential use of a plant may influence in the conclusions about the vegetable resources use in human populations, considering the principles of the ecological apparency hypothesis. In other words, if the distinction is made between current and potential use of a species, the perceived relationship between the use and availability of a resource would likely change because people do not always use all resources they are aware of (Albuquerque, 2006; Estomba et al., 2006; Ramos et al., 2008a, 2008b). Some plants that are known by a human population may not be used currently, but may become incorporated or re-incorporated into regular use in the future (Albuquerque, 2006).

In practice, it appears that the relationship between the availability of a plant resource and its actual use varies depending on the category of use. Lucena et al. (2007) have observed that the ecological apparency hypothesis correctly predicted the use of woody species. They found that use value was directly correlated with ecological dominance, whereas medicinal species (non-woody) had use values correlated only with relative frequency. However, these authors have calculated the use value without taking into consideration the effective uses singly. The same correlations were found by Lawrence et al. (2005).

Thus, in the context of these variations and limitations of the use value concept relative to the ecological apparency hypothesis, this study was carried out in the rural communities from Barrocas and Cachoeira (Soledade, Brazil), aiming to evaluate if different methods of calculating the VU of a species may interfere in the conclusions about its use and its relationship with this hypothesis, and change the list of the most important species locally, and the consequences of these variations for local conservation actions of such species. For a such end, it has been considered the following calculation ways of the VU: 1 - current use value (VUC), based only on reports of actual use of a plant; 2 - potential use value (VUp), calculated from reports of the known usefulness of a resource but not its actual use; and 3 - general use value (VUG), without distinction between VUC and VUp.

## 2. Methods

### 2.1. Regional context and study area

This study was carried out in Soledade city (Paraíba state, Northeastern Brazil). Soledade has got a warm, semi-arid climate (Köppen's BShs) with up to eleven dry months (Atlas Geográfico do Estado da Paraíba 1985) and a short rainy season with an annual rainfall of approximately 300 mm, one of the lowest totals in Northeastern Brazil (SEBRAE, 1998). The predominant vegetation is

hyperxerophilous shrub-arboreal; important trees include *Erythrina velutina* Willd. (mulungu) and *Schinopsis brasiliensis* Engl. (baraúna), and important shrubs include *Aspidosperma pyrifolium* Mart. (pereiro) and *Croton blanchetianus* Baill. (marmeleiro) along with a wide variety of cactus, which have become particularly visible as a result of the massive deforestation of arboreal species for energy production (charcoal and firewood). The soil is predominantly halomorphic (with high salinity), which prevents the use of groundwater (SEBRAE, 1998).

### 2.2. Studied communities

This study was carried out in the rural communities from Barrocas and Cachoeira, 18 km from Soledade's urban center. These communities have been chosen because their housing arrangements, which facilitate access to the residents, and the fact that previous ethnobiological studies have already been carried out there (Sá e Silva et al., 2009; Almeida et al., 2010).

Barrocas is made up of private farms and 12 houses, while Cachoeira includes 18 houses along a rural highway that resemble a village. Another aspect of these communities is that in Barrocas, only landowners have access to woodlands, while in Cachoeira, all residents use the single woodland. Cachoeira has got a soccer field, three bars, and a Catholic church under construction (Sá e Silva et al., 2009). Due the scarcity of the rainfall in the region, rain collection tanks have been built by government and non-governmental organizations (NGOs) in all houses from the two communities. These tanks are often supplied with water trucks brought by the Brazilian Army. The vegetation in both communities is similar, with a predominance of a shrub-herbaceous layer and trees along rivers. There are many cactus and bromeliads species, which are widely used in animal feeding during prolonged droughts.

### 2.3. Vegetation sampling

To test the ecological apparency hypothesis, it has been collected phytosociological information in the two communities. It has been made 100, 10 m × 10 m semi-permanent plots and recorded all woody species that had a stem diameter at ground level (DGL) equal to or larger than 3 cm, excluding cactus, bromeliads, vines, lianas, and small herbaceous plants (Araújo and Ferraz, 2010), with a total of 1 ha in each community.

In Cachoeira, it has been allocated all plots in the woodland, occupying a total plot area of 1 ha. In Barrocas, as all properties are private, plots have been demarcated in four areas on three farms, 25 plots in each area. These areas have been chosen based on the presence of forest fragments and accessibility.

It has been measured the following phytosociological parameters: basal area, importance value, relative density, relative dominance, and relative frequency. Analysis followed Araújo and Ferraz (2010). Relative density (RD) was estimated by recording the number of individuals of a particular taxon regarding the total number of individuals sampled. Relative frequency (RF) has been estimated based on absolute frequency (AF) of a given species regarding the total frequency (TF), which represents the sum of all absolute frequencies. Relative dominance (RDo) represents the percentage of absolute dominance (AD) of a given species regarding the total dominance (TD).

### 2.4. Ethnobotanical survey

Ethnobotanical data have been collected using semi-structured interviews conducted from August 2006 to March 2008, visiting 10 from the 12 homes in Barrocas; because one resident has refused

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