Evaluating Two Quantitative Ethnobotanical Techniques

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Research

Abstract

A critical evaluation of two quantitative techniques used in ethnobotanical studies was undertaken using data concerning plant use in a rural community in the semi-arid region of Pernambuco State, northeastern Brazil. The relative importance of 36 native woody species reported as being useful by 98 informants was calculated employing the Use-Value (UV) and Relative Importance (RI) techniques. Both techniques place value on a given taxon based on the number of uses attributed to it. Results obtained for both techniques are positively correlated, suggesting that they can be used interchangeably to evaluate local knowledge of a given resource. The implications and interpretation limitations of these two techniques are discussed in detail.

Introduction

Quantitative techniques have been used in ethnobotany to compare the uses and the cultural importance of different plant taxa. These analyses are of great scientific interest as they reflect cultural value systems, and they may also aid in the conservation of biodiversity (Byg & Balslev 2001). It is expected that people will be motivated to conserve resources that are most important to them, in contrast to resources perceived as less useful (Byg & Balslev 2001, Garibaldi & Turner 2004). Phillips (1996), in a review of ethnobotanical techniques, pointed out that procedures based on “informant consensus” tend be more objective as they are designed to eliminate investigator bias in attributing relative importance to a given plant.

The use of quantitative techniques to evaluate the relative importance of plants in a given culture is common in ethnobotanical literature. Ever since the publication of the Use-Value index proposed by Phillips and Gentry (1993a, 1993b) (modified from Prance *et al*. 1987), similar approaches have been widely used by many different authors (Albuquerque *et al*. 2005a, Cunha & Albuquerque 2006, Galeano 2000, Gomez-Beloz 2002, Kristensen & Balslev 2003, Kvist *et al*. 2001, Torre-Cuadros & Islebe 2003). The most popular techniques (indices) are based on “informant consensus” - the degree of agreement among the different people interviewed concerning the use of a given resource (e.g., Byg & Balslev 2001). Numerous authors have applied these techniques to investigate the impact of exploitation of locally important resources, based on the supposition that however more important a resource is, the greater will be the exploitation pressure placed upon it. Although these interpretations have sometimes been questioned (Albuquerque & Lucena 2005, Silva & Albuquerque 2004), neither their use as tools for evaluating the importance of a given resource, nor their limitations or scope, have been critically examined. According to Reyes-García *et al*. (2006) it is necessary now for “studies that assess the reliability of the different indices que presumably proxy for the same phenomena”.

We performed a rapid and simple evaluation of the Use-Value (UV) and Relative Importance (RI) quantitative

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techniques. The goal was to assess the correspondence between these indices. The technique of Use-Value, which is based on the number of uses and the number of people that cite a given plant, has been widely used within the enthnobotanical community to indicated the species that are considered most important by a given population (e.g., Galeano 2000, Torre-Cuadros & Islebe 2003). One of the most common approaches has been to associate the Use-Value with questions of conservation, based on the idea that the most important species will suffer the greatest harvesting pressure (see Albuquerque & Lucena 2005 for a critical review of published works on this subject). The technique of Relative Importance (RI), proposed by Bennett and Prance (2000), was developed primarily for measuring the usefulness of medicinal plants. The RI value is derived from the number of indications (of pharmacological properties) for that species and from the number ailments that it is used to treat. As such, the importance of a species increases if it is used to treat more infirmities. As this technique was conceived, it would be possible to calculate the Relative Importance of a medicinal plant based only on secondary sources (journal publication, for example). A majority of the published works that have used this technique sought to identify the most important species to a given culture (taking into account either their exotic or native origin, as well) (Almeida & Albuquerque 2002, Janni & Bastien 2004); compare differences between the historically documented and contemporary importance of species (Janni & Bastien 2000); and to test hypothesis related to the use, knowledge, and conservation of medicinal plants (Almeida *et al*. 2005, Silva & Albuquerque 2005).

Both techniques are used as measures of relative importance, but neither distinguishes knowledge of a resource from its actual use and, as such, they are both treated here a measures of knowledge (for a brief review of the question of knowledge concerning a plant versus its effective use, refer to Reyes-Garcia *et al*. 2005), or of "theroretical dimension" according to Reyes-Garcia *et al*. (2006). Although the Relative Importance technique is much less used than the Use-Value, we chose to examine it here due its useful manner of calculation. Both techniques consider the number of uses attributed to a given taxon in determining its importance (Albuquerque & Lucena 2005, Phillips 1996, Silva & Albuquerque 2004, Silva *et al*. 2006), but they differ in that only the Use-Value technique includes the number of people that cite information for a given taxon (i.e. it is directly based on informant consensus). As such, some authors suggest that the importance of a plant can be considered to be a synthesis of its various uses (e.g., Byg & Balslev 2001). In that sense, we raise the following questions in this paper: Is there a relationship between the values obtained for a given species using the two techniques cited? Is there a difference in the ranking of the species generated by each technique? We believe that differences will be seen, as the two techniques are calculated in different manners, but both will tend to agree on the most important species (see Silva *et al*. 2006 who also compared two techniques used in ethnobotanical studies). Additionally, we evaluated the context of the application of the two techniques, as well as their theoretical and practical limitations. The present study is part of a wider project on ethnobiology underway in northeastern Brazil, especially in areas of dry land vegetation (Albuquerque & Albuquerque 2005, Albuquerque & Andrade 2002a,b, Albuquerque & Lucena 2005, Albuquerque *et al*. 2005a,b, Almeida & Albuquerque 2002, Almeida *et al*. 2005, Cunha & Albuquerque 2006, Ferraz *et al*. 2005, Gazzaneo *et al*. 2005, Lucena *et al*. 2006, Monteiro *et al*. 2006a,b, Silva & Albuquerque 2005, Silva *et al*. 2006).

Study Area

The present study was undertaken in an area of dry-land Caatinga vegetation in northeastern Brazil. Field work was undertaken in the "Riachão de Malhada de Pedra" community, in the municipality of Caruaru, in Pernambuco State, northeastern Brazil (Figure 1). The region has a hot, semi-arid climate, with average temperatures of 22°C and an average yearly rainfall of 609mm. Rainfall is concentrated in the months of June and July. The local vegetation is hypoxerophilous (Portal Caruaru 2003). The inhabitants of this community depend heavily on plants harvested from a nearby forest fragment belonging to the "Empresa Pernambucana de Pesquisa Agropecuária" Experimental Station (IPA). The station is located at 8°14'18"S and 35°55'20"W, and lies nine kilometers northwest of the city of Caruaru, along the state highway PE-095 (Empresa Pernambucana de Pesquisa Agropecuária 2003).

The community of "Riachão de Malhada de Pedra" is divided into small urban agglomerations and isolated farm houses, with a total of 117 habitations. These people traditionally practice pastoral and agricultural activities, especially susbsistence agriculture (especially corn and beans). Drinking water for the community of "Riachão de Malhada de Pedra" is obtained once a week (Sunday) at a municipal fountain located in the village. Income is principally derived from work offered at the IPA and on larger neighboring farms, as well as transportation services to Caruaru and other nearby towns.

More details concerning the biological and cultural environment in the region can be found in Alcoforado-Filho *et al*. (2003), Lucena (2005), Monteiro (2005), Monteiro *et al*. (2006a) and Oliveira (2005).

Methods

Ethnobotanical data was collected using semi-structured interviews held between January 2003 and July 2004. The informants were all family heads, independent of their age or gender. All of the homes in the community were visited, totaling 98 interviews. Some people refused to be interviewed or, occasionally, the house was unoccupied dur-

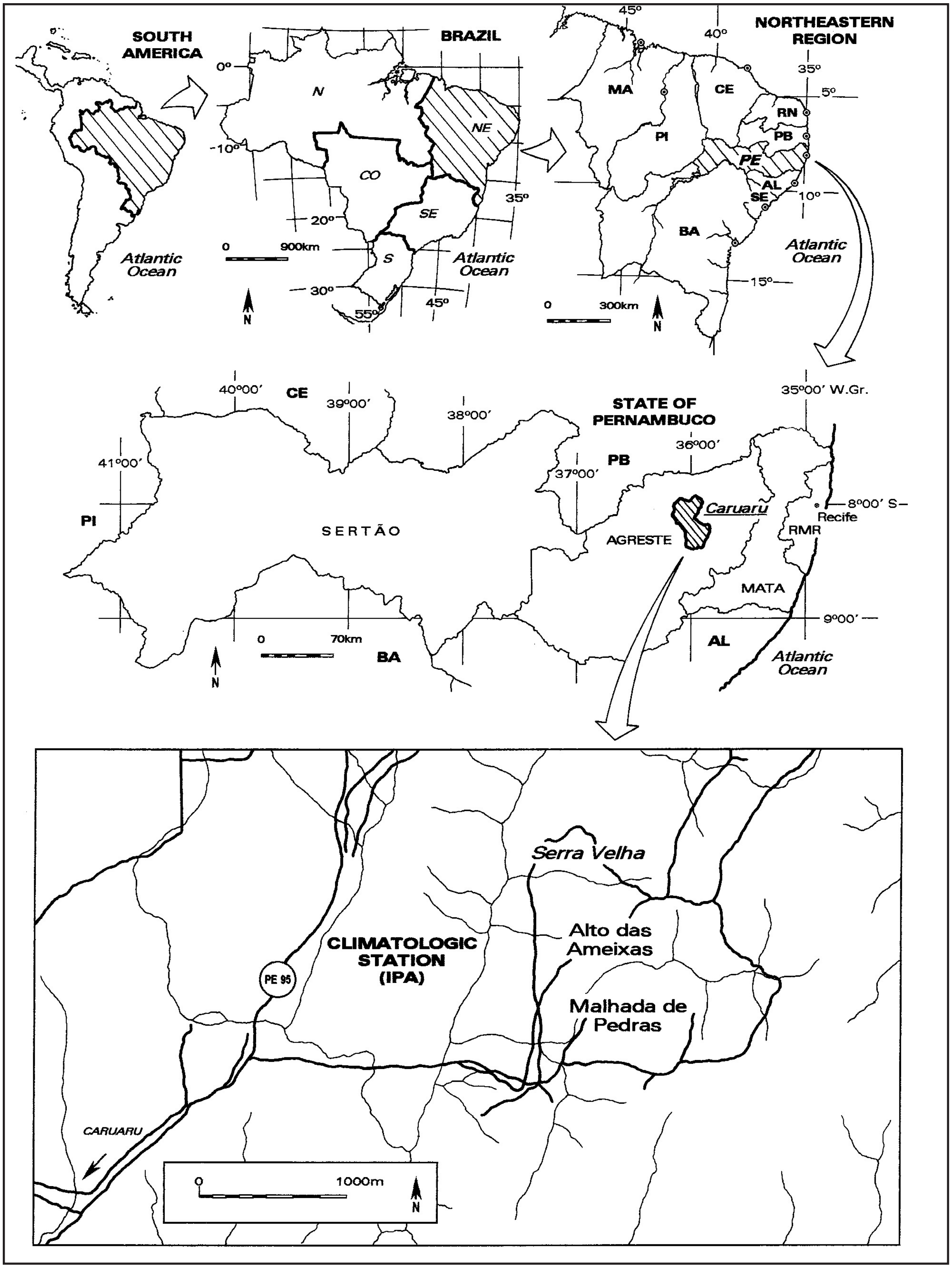

Figure 1. Location of the "Riachão de Malhada de Pedra" community in the municipality of Caruaru, state of Pernambuco, Brazil (Monteiro *et al*. 2006a).

ing the research period. One informant per household (the household head, or the person responsible for the dwelling) was approached and invited to participate in the interview. A total of 55 men and 43 women were interviewed. All participated voluntarily, and were at least 18 years old. The interview focused on basic questions concerning the informant's knowledge of the uses of local plants. A typical question would be: which local plants do you know and/or use? Depending on the response, more specific questions concerning the types of uses were gradually formulated. To help assure that the information was as unbiased as possible, efforts were made to avoid the presence of other people during the interviews. Participant observation was used to enrich the information gathered (Albuquerque & Lucena 2004a,b).

Semi-structured interviews allow researchers to gather a great deal of information from a large number of people in a relatively short period of time, while leaving the interviewee more at ease to answer or comment on the questions put to them. On the other hand, one of the drawbacks of this technique is that is makes it much more difficult to standardize and analyze the responses. In our case, data analysis was based exclusively on locally known useful plants. It is possible that alternative methods of data gathering would generate additional information useful for this research, some of which might even affect the results of some of the techniques used to analyze our data. This would need to be tested in future work.

As part of the interviews, a "guided-tour" technique was employed, consisting of walking through the forest with one or more informant in order to observe *in loco* the plants cited and to collect samples for posterior botanical identification (Albuquerque & Lucena 2004a). These collections were deposited in the PEUFR herbarium, in the Departamento de Biologia, Universidade Federal Rural de Pernambuco. The plants cited were later placed into the following use-categories as appropriate: technology, medicinal, food, construction, fuel, grazing, veterinary, and others. Within the category "others" were included species cited for use in magical-religious rites, poisons, and personal hygiene. The specific types of uses mentioned by each informant were included in each of these general categories.

The local importance of each species cited was calculated using two different techniques: Use-Value (UV) and Relative Importance (RI). The Use-Value was calculated using the formula $UV = \sum U_i/n$ (Rossato *et al*. 1999; Silva & Albuquerque 2004; modified from Phillips and Gentry 1993a, 1993b), where: U_i = the number of uses mentioned by each informant for a given species, n = the total number of informants. For example, if informant X mentioned 7 uses for species a, and informant Y mentioned 3 uses for the same species, the UV of species a would therefore be 5, (7+3) uses mentioned divided by 2 informants. As such, the Use-Value of a given plant is determined by the number of uses locally attributed to it in relation to the number of informants. In the original formulation of Phillips and Gentry (1993a), these authors considered in their calculations the number of times that each informant referred to a given species. Relative Importance (RI) is calculated using the formula RI = NUC + NT (adapted from Bennett & Prance 2000), where: NUC = number of use-categories of a given species (NUCS) divided by the total number of use-categories of the most versatile species (NUCVS). NT = is given by the number of types of uses attributed to a given species (NTS) divided by the total number of types of uses attributed to the most important taxon (NTMIT), independent of the number of informants that cite the species. For example, species a is cited as being used in medicine and construction (2 use-categories), and as a medicine it is used to treat coughs, headaches, and stomach aches, while in construction it is used to make fences and build houses (thus totaling 5 types of uses). On the other hand, species b might be more verastil, being used in various categories and types of uses (possibly 4 and 10, respectively). As such, the IR of species a would be 1.0 = (2/4) + (5/10).

The Kolmogorov-Smirnov test was used to verify data normality (Zar 1996). In order to test if there was a relationship between the values obtained for each of the two indexes, the Spearman correlation coefficient was employed (Sokal & Rholf 1995). A correlation analysis was also performed, taking into account the value obtained with each tecnhique versus the number of use-categories, the number of informants that cited a given speceis as being useful, and the total of all the use citations.

Results

Informants identified a total of 36 native woody species as being useful (Table 1). On the average, the technique of Relative Importance tended to over-evaluate the species (mean = 0.88, standard deviation = 0.43) in relation to the Use-Value technique (mean = 0.41, standard deviation = 0.56) (Table 2). The two techniques were strongly correlated (r_s= 0.75; P< 0.0001), however, indicating that a given species tends to have the same importance irrespective of the technique employed. The average number of use categories in the sample was 3.8. The techniques depended strongly on the number of use-categories attributed to any plant, although this relationship was much stronger (as would be expected) for the Relative Importance technique (r_s= 0.93; P< 0.0001) than it was for the Use-Value (r_s= 0.65; P< 0.0001). When the correlations were analyzed considering the above average species (r_s= 0.74; P< 0.001) and below average species (r_s= 0.64; P< 0.05) in the use categories, it was seen that there was a strong relationship between the two techniques, being even greater among species that had more local uses. In the same sense, there is a significant correlation between the techniques in relation to the number of informants that cited a given species as being useful (UV: r_s= 0.97, P<

Table 1. Classification of woody plants known to a rural community in the municipality of Caruaru (northeastern Brazil). based on two quantitative measures of relative importance. # = Number of use categories. Inf = Number of informants. ∑ = Number of citations. UV = Use-Value. RI = relative importance. *Plant material collected in the same area, although at different times.

Family	Species	Vernacular (Voucher)	#	Inf	∑	UV	IR
Anacardiaceae							
	Myracroduon urundeuva (Engl.) Fr. All.	**Aroeira** (46171)	6	80	182	1.85	1.70
	Schinopsis brasiliensis Engl.	**Braúna** (33394*)	6	67	136	1.38	1.65
Bombacaceae							
	Chorisia glaziovii (O. Kuntze) E. Santos	**Barriguda** (15584*)	2	10	10	0.10	0.38
Boraginaceae							
	Cordia trichotoma (Vel.) Arráb. ex Steud.	**Frei Jorge** (44266)	4	22	30	0.30	0.87
	Cordia globosa (Jacq.) Humb., Bompl. & Kunth	**Maria Preta** (44238)	3	5	8	0.08	0.57
Burseraceae							
	Commiphora leptophloeos (Mart.) J. B. Gillet	**Umburana** (43840)	6	34	49	0.5	1.55
Caesalpiniaceae							
	Bauhinia cheilantha (Bong.) Steud.	**Mororó** (43839)	3	27	77	0.78	0.92
	Caesalpinia pyramidalis Tul.	**Catingueira** (44239)	4	60	119	1.21	1.07
Capparaceae							
	Capparis jacobinae Moric.	**Incó** (43823)	5	6	12	0.12	1.01
	Capparis hastata L.	**Feijão-de-boi** (43822)	4	26	67	0.68	1.17
Clusiaceae							
	Clusia sp.	**Gameleira** (45765)	2	3	4	0.02	0.33
Euphorbiaceae							
	Croton argyroglossum Baill.	**Velame Branco** (44267)	2	5	8	0.08	0.58
	Croton blanchetianus Baill.	**Marmeleiro** (43833)	7	39	74	0.75	1.75
	Croton rhamnifolius Kunth.	**Velame** (43804)	6	16	18	0.18	1.20
	Jatropha curcas L.	**Pinhão Manso** (43838)	3	9	10	0.10	0.67
	Jatropha mollissima (Pohl) Baill.	**Pinhão Brabo** (43809)	4	28	34	0.34	0.67
	Manihot cf. *dichotoma* Ule	**Maniçoba** (43816)	2	7	8	0.08	0.38
	Sapium sp.	**Burra Leiteira** (46191)	3	24	30	0.30	0.57
	Sebastiana jacobinensis (Mull. Arg.) Mull. Arg.	**Leiteiro** (44245)	4	4	5	0.05	0.77
Malpighiaceae							
	Malpighiaceae 1	**Rama Branca**	3	8	12	0.12	0.52
Meliaceae							
	Cedrela odorata L.	**Cedro** (44265)	4	4	13	0.22	1.02
Mimosaceae							
	Acacia sp.	**Rapadura** (45766)	1	3	3	0.03	0.19
	Acacia farnesiana (L.) Willd.	**Jurema Branca** (44262)	4	10	15	0.15	1.02
	Acacia paniculata Willd.	**Unha-de-gato** (43811)	3	20	23	0. 23	0.67
	Acacia piauhienses Benth.	**Calombi Branco** (44268)	3	29	42	0.42	0.62
	Anadenanthera colubrina (Vell.) Brenam	**Angico** (43824)	7	90	261	2.66	2
	Parapiptadenia sp.	**Miguel Correia** (45771)	3	5	8	0.08	0.62
	Piptadenia stipulacea (Benth.) Ducke	**Calombi** (44268)	3	33	38	0.38	0.62
Myrtaceae							
	Eugenia sp.	**Batinga** (46127)	4	4	8	0.08	0.77
	Eugenia uvalha Camb.	**Ubaia** (457773)	5	8	19	0.19	1.01
	Myrciaria sp.	**Jaboticaba** (45774)	5	18	29	0.29	1.06

Family	Species	Vernacular (Voucher)	#	Inf	∑	UV	IR
Nyctaginaceae							
	Guapira laxa (Netto) Furlan	**Piranha** (44264)	4	12	19	0.19	0.87
Rhamnaceae							
	Zizyphus joazeiro Mart.	**Juá** (45761)	5	37	80	0.81	1.31
Solanaceae							
	Capsicum parvifolium Sendtm.	**Pimentinha** (43844)	3			0.09	0.62
Verbenaceae							
	Lantana camara L.	**Chumbinho** (43851)	2			0.13	0.53
	Lippia sp.	**Camarazinha** (46124)	2			0.03	0.43

Table 2. Descriptive statistics of the two quantitative measures of relative importance. UV = Use-Value. RI = relative importance.

Statistics	UV	IR
Average	0.41	0.88
Standard Deviation	0.56	0.43
Mínimum	0.02	0.19
Maximum	2.66	2.00
Percent Variation	135.74%	49.64%

0.001; RI: rs= 0.69, P< 0.001) with the total number of citations for a given plant (UV: rs= 0.99, P< 0.001; RI: rs= 0.74, P< 0.001). These relationships were strongest using the Use-Value technique.

Table 3 lists the ordination of the 10 most important species as derived by each technique. In general, both techniques considered the same species, the principal differences being in their ordering. *Anadenanthera colubrina* (Vell.) Brenan occupied first place for both techniques. *Myracrodruon urundeuva* (Engl.) Fr. All. occupied 2nd place using the Use-Values technique, and 3rd place using the Relative Importance technique. However, some differences were observed when comparing all the species listed by the two techniques. For example, *Acacia piauhienses* Benth. and *Bauhinia cheilantha* (Bong.) Steud. only appeared on the Use-Value list, probably because these two plants had three use-categories attributed to them by a number of informants. Their absence from the RI list was probably related to the fact that this technique only valorizes spe-

Table 3. Ranking of the species of the plants considered to be most important to a rural community in the municipality of Caruaru (northeastern Brazil), based on two quantitative measures of relative importance. UV = Use-Value. RI = relative importance.

Species	Ranking	
	UV	IR
Acacia piauhienses Benth.	10º	-
Anadenanthera colubrina (Vell.) Brenam	1º	1º
Bauhinia cheilantha (Bong.) Steud.	6º	-
Caesalpinia pyramidalis Tul.	4º	9º
Capparis hastata L.	8º	8º
Commiphora leptophloeos (Mart.) J. B. Gillet	9º	5º
Croton blanchetianus Baill.	7º	2º
Croton rhamnifolius Kunth.	-	7º
Myracroduon urundeuva (Engl.) Fr. All.	2º	3º
Myrciaria sp.	-	10º
Schinopsis brasiliensis Engl.	3º	4º
Zizyphus joazeiro Mart.	5º	6º

cies with a significant number of uses, independent of the number of informants that may cite them. Likewise, *Myrciaria* sp. and *Croton rhamnifolius* Kunth. appear on the RI list but not the UV list (see Table 3). The reason for their presence on the RI list lies in the fact that these two species had five and six use categories attributed to them, respectively. The attribution of many use categories also determined the ranking of *Croton blanchetianus* Baill; its seven use-categories were responsible for its jump from 7th on the UV list to 2nd place on the RI list.

Discussion

Relative Importance or Cultural Importance?

Before presenting a complete analysis of the data, we would like to discuss our use of certain terms. The terms "cultural importance" and "relative importance" are usually used interchangeably in the literature to refer to the importance of certain plants to a given culture. However, a majority of quantitative techniques are based on the premise that Relative Importance is a measure of the types of uses attributed to the species, while possibly ignoring certain cultural and social factors. Byg and Balslev (2001), for example, have point out that although many ethnobotanical studies presume that although the importance of a plant derives from the different ways it is used, this premise rarely has been tested. These authors encountered a positive correlation between the importance value of a plant (measured by the number of informants that considered the plant important), the Use-Value, and the number of uses. According to these authors, this reinforces the idea that importance is a synthesis of the multiplicity of uses that a plant offers. On one hand, our results reinforce this idea, but on the other hand, they indicate that the importance of a plant may not be solely determined by the number of uses it has, but also by how well known it is. In some cases, the influence of the number of informants maximizes the Use-Value of a given species when they attribute many uses to a plant. But if only a single person cites many uses for a given plant, a high value would seem to be idiosyncratic. As such, we feel that both of these techniques measure only certain aspects of the relationship between people and plants and, as such, interpretations of the cultural importance of these species based on these indices are not on firm ground.

The importance, or cultural significance, of a given plant to a given community does not always seem to be solely a function of the number of applications attributed to it in a given social and cultural context. For example, *Mimosa tenuiflora* (Willd.) Poir. (known as **jurema-preta** in northeastern Brazil) has very important religious-magic significance to many indigenous groups, and they even identify themselves as an ethnic group in terms of their use of this plant (Albuquerque 2001, Mota & Albuquerque 2002). The first attempts to evaluate the cultural significance of plants were made by investigators within the anthropological tradition (Berlin *et al*. 1966, Stoffle *et al*. 1990, Turner 1988). Using a systematic perspective, the identification of a culturally significant plant should take into account various aspects, such as: intensity, types, and multiplicity of uses; name and terminology within the native language; the plant's role in narratives, ceremonies, or in symbolism; persistence and memory of its uses in spite of cultural changes; its position with the culture (Garibaldi & Turner 2004). Until it can be demonstrated experimentally that the results supplied by techniques emphasizing the multiplicity of uses generate similar results as those that incorporate other cultural elements.

At least one of the techniques evaluated, the Use-Value, is based on idea of informant consensus. Although the technique of RI does not reflect directly on the consensus of responses among the interviewees, it does in fact seem to be influenced by this factor. Informant consensus is based on the theory of cultural consensus, whose central idea is the use of agreement between informants in order to infer about the information shared in a given culture (Romney *et al*. 1986, 1987). The theory of cultural consensus is based on three premises: "1. There is a culturally correct answer for every question; 2. Each informant responds to the tasks independently of other informants; 3. The probability that an informat will answer correctly a question in a domain of knowledge reflects the informant's competence in that domain" (Reyes-Garcia *et al*. 2004). Thus, the use of indices in ethnobotany, based on the concept of consensus, seeks to identify plant taxa demonstrating a high degree of shared knowledge among individuals within a given culture. In this sense, a plant with a high use value would theoretically have a correspondingly high cultural consensus (although limitations to this interpretation are discussed in the next section). But, the UV index is a simple evaluation that differ of Cultural Consensus Analysis (see, for example, Romney *et al*. 1986, 1987).

Applications and Limitations of the Techniques

We have confirmed our original idea that there are in fact differences generated by the two techniques, although these are relatively small. The explanation for the significant correlation between the indices is that the techniques capture the same aspect of traditional knowledge. The Use-Value places more emphasis on species that have many uses, even if these uses are only known to a few people (Silva & Albuquerque 2004, Silva *et al*. 2006). The number of uses is therefore the principal factor in this technique and, although associated with the consensus of the informants, it will in great part determine the final results. Phillips *et al*. (1994) defend the use of this technique based on the objectivity of the analysis and the absence of any investigator bias. Other authors have used the Use-Value technique to infer the use pressure impinging on a given resource (based on the idea that any important plant with be more heavily used) (Galeano 2000, Luoga *et al*. 2000) and/or to compare knowledge concerning plant resources between different groups of informants or ethnic groups (Gomez-Beloz 2002, Kristensen & Balslev 2003). The first inference is questionable, as we are not aware of any work that has tested the hypothesis that there exists a relationship between the Use-Value and the frequency (or intensity) of extraction for any plant taxon. The second inference, that these techniques can be used as measures of knowledge, seems more acceptable to us. Some workers have been able to associate the Use-Value of a plant with its local availability, supporting the view that there is a direct relationship between the relative importance of a plant and its local abundance (see Albuquerque & Lucena 2005, Albuquerque *et al*. 2005a, Phillips & Gentry 1993a,b).

The technique of Relative Importance (RI) emphasizes those plants that have the greatest absolute number of uses. As such, it can not be used to validate the argument that the importance of a given plant is associated with its multiple uses. As the results of both techniques are positively correlated, it is reasonable to suggest that they can be used interchangeably to evaluate local knowledge of a given resource. In the face of these considerations, however, we suggest that these techniques be used to measure the importance of plants in very specific contexts. These two measures reveal only knowledge associated with a given species; use pressures cannot be inferred, nor evaluations of the plant's cultural importance or significance. More research will be necessary to determine if the cultural importance of any plant can really be measured by techniques such as those cited above. In light of our results, however, some potential applications of these techniques can be inferred. The UV technique: is indicated when the selection of interviewees is random, as it is strongly influenced by the interviewees themselves; it is ideal for evaluating the potential use of a given plant, and the extent of any knowledge about it, as the technique is derived from the perspective of what people consider useful. The RI technique: can be used with secondary data, without the need for direct interviews, for the results are influenced by the use-categorties. This technique is useful in structured studies where the researchers can clearly and objectively define the categories to allow comparisons with other studies, and it can be used with small numbers of interviewees (ideally among people with a wide cultural knowledge) as it is less sensitive to the number of informants who cite a given plant.

The results demonstrated that both techniques have basic limitations that interfere with the values that can be attributed to a species: the RI technique gives more importance to species with elevated numbers of uses, but without taking into consideration the number of people that cite these uses; the Use-Value technique, on the other hand, is greatly influenced by the number of people citing the uses of a species, thus a plant may be highly rated even if its many uses were cited by only a small number of people. As such, differences tend to increase when a species is heavily used (Use-Value), or when it has many uses attributed to it (RI). The two techniques can be similarly affected by individual informants who intensively use, or cite, a single species. A disadvantage of both techniques is that they do not distinguish between past use, knowledge, and actual use (or real use, for some authors). Although both techniques can be influenced by "individual competence" (for example, the participation of someone with exceptional knowledge may favor a given plant), the RI technique is less vulnerable to this variable as it does not take into account the number of informants in calculating the final results. However, the technique of Use-Value may indicate how knowledge about a certain plant is distributed in a community, but it requires that each informant be interviewed separately in order to avoid influencing one another, which involves much more time and effort in data collecting.

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