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A Variation of Checklist Interview Technique in the Study of Firewood Plants

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ABSTRACT

Woody plant parts are not commonly used as stimuli in ethnobotanical studies to elicit information about wood resources. The present work describes the use of a checklist interview technique using plant part samples as visual stimuli in testing the reliability of local information concerning the identity of firewood in a rural community in northeastern Brazil. Twenty-five informants were selected and subjected to semi-structured interviews about plants they knew, used, and preferred as firewood. Subsequently, 38 samples of woody species were shown to these informants for species identification. Overall, an average of 33.89% of the species were correctly recognized, but if known, used, or preferred species were considered individually, the recognition percentages increased to 63.06%, 73.05%, and 88.67%, respectively. Checklists including branch and trunk samples can be useful tools in collecting ethnobotanical data concerning wood usage, but require the researcher to have a good knowledge of local taxonomic terms in order to avoid identification errors.

Keywords: Caatinga, fuelwood, visual techniques

INTRODUCTION

Visual stimuli have been widely used in ethnobotanical surveys, usually to obtain information about plant identities and uses, and commonly include either voucher specimens (Holloway and Alexander 1990; Stoffle *et al.* 1990; Gaur and Bhatt 1994; Albuquerque *et al.* 2005a; Thomas *et al.* 2007), fresh plants (Anderson and Posey 1985; Griffin 2001; Ladio and Lozada 2004), plant photographs (Holloway and Alexander 1990; Monteiro *et al.* 2006a; Thomas *et al.* 2007), drawings (Griffin 2001), products derived from plant materials (Mutchnick and McCarthy 1997; Albuquerque *et al.* 2005a), or individual plants *in situ* (Phillips and Gentry 1993; Milliken and Albert 1996). The premise behind the use of these visual stimuli is that visual aids can elicit more information about plant uses and help assure that the interviewee and the interviewer are in fact talking about the same plant (Martin 2001). However, the efficiency of this technique depends on the quality of the visual material used – whether a plant, plant part, or a representation (Martin 2001). Inaccurate photographs or poorly handled plant material can compromise data quality (Martin 2001; Medeiros *et al.* 2008).

Many ethnobotanical studies have employed visual stimuli techniques without using an explicit designation, while others have variously identified the visual tools used as: the “artifact/inventory” technique, used to solicit information about artifacts made from plant material (Mutchnick and McCarthy 1997); the “walk-in-the-woods” technique, where the informant is interviewed in the field in immediate contact with the plants; or the “checklist-interview” technique, which consists of presenting a list of plant names to elicit information about them (Alexiades 1996). Studies employing checklist techniques often use some sort of visual stimulus to aid the interviewee in describing plant uses (Alexiades 1996).

The present study proposes the use of a visual stimulus that is uncommonly used isolated: samples of woody plant parts, such as trunks and branches. These stimuli can be useful in examining woody resource usage as they represent the resource material in the same basic form in which it is used. We sought to test the reliability of the checklist technique in terms of the identification of local firewood species by examining the recognition of plant part samples from species used by members of a rural community in northeastern Brazil, and to verify the effects of knowledge, use, and preference on species recognition.

MATERIALS AND METHODS

Study area

The present study was carried out in the community of Riachão de Malhada de Pedra (**Fig. 1**), Gonçalves Ferreira District, Municipality of Caruaru, Pernambuco State, Brazil. The municipality is located approximately 136 km from the state capital of Recife (8° 17′ 00″ S and 35° 58′ 34′ W). Caruaru is located in a semi-arid region with an average annual temperature of 24°C, average annual precipitation of about 609 mm, and a rainy period that extends from June to July (Portal Caruaru); the administrative center of the municipality is at an altitude of 554 m. Caruaru has a population of 253,634 with 217,407 inhabitants in urban areas and 36,227 in rural areas (IBGE 2000). Approximately 1,000 m^3 of fuelwood was commercially produced in the municipality in 2005, generating approximately US $4,000 in income (IBGE 2006).

Although most of the inhabitants of the municipality of Caruaru live in urban areas, 87.5% of the 5275 inhabitants of the Gonçalves Ferreira District live in rural zones (IBGE 2000), including the entire community of Riachão de Malhada de Pedra, which has 123 households and a population of 493 (Secretaria Municipal de Saúde 2005). Most of the inhabitants there make their living by farming, although a small textile industry is gaining local importance, principally in response to demand generated by an important outdoor market in Caruaru. Catholicism is the predominant local faith.

The community of Riachão de Malhada de Pedra is located next to a forest area that is part of the IPA Experimental Station (Instituto Agronômico de Pernambuco). This forest fragment has

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Fig. 1 Community of Riachão de Malhada de Pedra, Pernambuco, Northeastern Brazil. (**A**) Vegetation in the dry season; (**B**) Overview of the forest area in the wet season; (**C**) Household aspect; (**D**) Agricultural work.

Fig. 2 Firewood use in the community of Riachão de Malhada de Pedra, Pernambuco, Northeastern Brazil. (**A**) Firewood stock; (**B**) An external stove house with a firewood stock; (**C, D**) Process of cooking with firewood.

been protected by the IPA for more than 30 years (Alcoforado-Filho *et al.* 2003) and is composed of hipoxerophytic arboreal *caatinga* (dryland) vegetation, with many thorny species. Previous surveys have identified 96 taxa in the forest, belonging to 41 plant families, with the most important arboreal families being Mimosaceae, Euphorbiaceae, Cactaceae, Caesalpiniaceae Capparaceae, and Rubiaceae (Alcoforado-Filho *et al.* 2003). The most common arboreal species are *Schinopsis brasiliensis* Engler, *Caesalpinia pyramidalis* Tul., *Bauhinia cheilanta* Steud., and *Maprounea guianensis* Aubl. One of the most important shrub genera is C*roton*, represented principally by *Croton blanchetianus* Baill. (Alcoforado-Filho *et al.* 2003; Lucena *et al.* 2007a, 2007b).

In spite of a nominal prohibition against harvesting any plants in the IPA forest reserve, access to the area is not controlled and the vegetation is intensively used. This is especially evident in terms of fuelwood, as many local inhabitants use biofuels for cooking (**Fig. 2**) as an alternative to the more expensive natural gas.

Data collection

This study was part of a larger investigation of fuelwood usage in the community of Riachão de Malhada de Pedra that sought to identify the woody species known, used, and preferred by the local population. The first stage of this study was undertaken between October, 2005 and April, 2007, and involved semi-structured interviews (Albuquerque *et al*. 2008) administered to the male or female household head (the one who was present when the interviewer arrived). In addition to their socio-economic data, we noted the species known, used (if the informant used these materials), and preferred by the informants as firewood. A species was considered "known" if the informant indicated that it could be used for firewood (whether it was in fact used by the informant, or not). A species was considered "used" only if the informant actually used it as a fuelwood. A species was classified as "preferred" if, for any reason, it had the interviewee's preference and the informant could choose more than one species to be preferred. More detailed information about the results of the first part of the survey can be found in Ramos *et al.* (2008a, 2008b). Of the 102 different people interviewed in the first stage of this study, 33 used firewood - and among those, 25 took part in the second phase of the work (the remaining eight firewood users were not encountered again in their residences during the second phase of the research). As such, this study used data only from the 25 informants who

Fig. 3 Samples of branches and trunks introduced to the informants from the community of Riachão de Malhada de Pedra, Pernambuco, Northeastern Brazil.

took part in the both phases of the survey.

In the second phase (conducted in May, 2006) branch or trunk samples were collected from 38 woody species. The species selected for collection were those that had been cited as used, or preferred, or that were found in firewood stocks during the first phase visits. Wood sample collections were made with the help of a key-informant, a person recognized as a plant expert in the community. The branches and trunks collected were cut into uniform 3-5 cm diameter by 10 cm long samples (one sample for each species) which were numbered for our identification (**Fig. 3**).

A variety of the checklist-interview technique was applied with the 25 informants, using the collected wood part samples as visual stimuli. The informants were asked to try to identify of each sample, and their responses were classified as (1) *recognition*, when the informant correctly identified the species; (2) *mistake*, when the informant did not correctly identify the species, and (3) *abstention*, when the informant preferred not to respond.

The efficiency of the checklist-interview technique can be limited by variability in the local folk taxonomic system (Alexiades 1996). In the present study, however, vernacular identification by the informants could be satisfactory related to scientific names as a good understanding of the local taxonomy had already been generated by earlier surveys conducted in the same community (Albuquerque *et al.* 2006; Monteiro *et al.* 2006a; Florentino *et al.* 2007; Lucena *et al*. 2007a, 2007b; Oliveira *et al.* 2007). Interviewees were also questioned about the characteristic(s) that led to their identification of any given species.

The plant species examined in this study were classified according to their origin (native or exotic), as well as according to their distribution (restricted or non-restricted). We considered native species those that originally occur in the regional *caatinga* (dryland) biome; while exotic plants were those that were locally cultivated, spontaneous, or sub-spontaneous but originally from other biomes. We classified restricted species as those with populations limited to a few areas of adjacent forest fragments and not occurring (or occurring only very infrequently) in the community area (anthropogenic zone). Non-restricted species are well-distributed in the adjacent forest fragments or very frequently encountered in the community area. All plant material used was deposited in the Professor Vasconcelos Sobrinho herbarium at the Universidade Federal Rural de Pernambuco (UFRPE).

Data analysis

Informants were classified according to their degree of recognition of plant species: class 1 (0-25% recognition), class 2 (26-50%), class 3 (51-75%), and class 4 (76-100%). The overall recognition percentage of each informant was calculated, as well as the recognition percentage for species cited as being known, used, or preferred.

The Kruskal-Wallis (Zar 1996) test was applied to examine differences in the total number of recognitions between: (1) native and exotic species, and (2) restricted and non-restricted species. These analyses were performed employing the absolute number of recognition for each species inside the previously described categories. For example, in the column of "native species" the number of people who recognized each native species was arranged. All statistical analyses were performed using the BioEstat 3.0 software program (Ayres *et al.* 2003), considering α=0.05.

RESULTS AND DISCUSSION

Informants recognized an average of 33.89% of the species, and most of them (13 people) were assigned to the 2^{nd} recognition class (26-50%). Although a 26-50% identification rate appears low, fuelwood species identification was actually significantly more successful than identification of medicinal plants in the same region using photographs as visual stimuli - which resulted in a recognition rate of less than 5% (Monteiro *et al.* 2006a). Earlier ethnobotanical studies utilizing visual stimuli did not specify the efficiency of the methods employed (Holloway and Alexander 1990; Stoffle *et al.* 1990; Gaur and Bhatt 1994; Mutchnick and McCarthy 1997; Albuquerque *et al.* 2005a)

Although there was a relatively low recognition rate when considering all species shown to the informants, if only the species actually known by each informant are considered, the average recognition increases to 63.06%, and most informants demonstrate a class 3 recognition rate (12 people). If only the species actually used by each informant are considered, the average recognition increases to 73.05%, and most informants (12) demonstrate a class 4 recognition rate. The greatest average recognition rate (88.67%) is observed when only the species preferred by each informant are considered, with most informants (20) being placed in class 4. Recognition rates for the known, used, and preferred species are considerably elevated in comparison to overall recognition. This result is reasonably expected, for if an informant had no familiarity with a given species, he/she would certainly not be expected to recognize it. Additionally, if an informant knows a given species, but from an entirely different context (not as a firewood), it might be more difficult to recognize it only within the context of firewood species.

The observed increases in recognition rates in passing through the categories of knowledge, use, and preference, are related to greater intimacy of the informants with preferred species (followed by used species, and then by known species). At the same time, the numbers of species included in each of these categories decreases, as informants know an average of 9.84 species, use 3.96 species, and prefer 1.94 species. This decrease in the number of species included in the known, used, and preferred categories is due to increasing selectivity by the informant, which in turn can be based on the availability of that resource or on its physical properties. Local availability can limit the number of species actually used in relation to the total number of species that may be known to the informants, as some known plants may simply not be available to collectors. Likewise, the physical properties of the fuelwoods may result in preferences in terms of their use (Abbot and Lowore 1999) – as only a few of the known wood species have high fuel values.

Species identification by informants

The most commonly identified species were *Anadenanthera colubrina* (Vell.) Brenan var. *cebil* (Griseb.) Reis (25 recognitions), *Acacia piauhiensis* Benth. (23 recognitions) and *Croton blanchetianus* Baill. (21 recognitions) (**Table 1**). These three species, in addition to being widely used for firewood, have other uses in the community (Lucena *et al.* 2007a, 2007b). *A. colubrina* was the only species recognized by all of the informants. In addition to being highly important to the local communities and widely used throughout the *caatinga* biome (Albuquerque 2006; Albuquerque *et al.* 2005a, 2005b; Monteiro *et al.* 2006a, 2006b; Lucena *et al.* 2007a, 2007b), this species is relatively easy to recog-

Table 1 Local identification of 38 species employed as firewood in the community of Riachão de Malhada de Pedra, Caruaru, Pernambuco, Brazil. Rec = Recognition (number of informants that correctly recognized the species), Mis = Mistake (number of informants that incorrectly identified the species), Abs = Abstention (number of informants that did not opine about the species identity), Orig = Origin, Dist = Distribution, N = Native, E = Exotic, R = Restrict, NR = Non-restrict.

Species	Local name	Rec	Mis	Abs	Orig	Dist
Anadenanthera colubrina (Vell.) Brenan var. *cebil* (Griseb.) Reis	Angico	25	0	0	N	NR
Acacia piauhiensis Benth.	Calumbi-branco	23	1	1	N	NR
Croton blanchetianus Baill.	Marmeleiro	21	3	1	N	NR
Manihot cf. dichotoma Ule.	Maniçoba	19	3	3	N	NR
Caesalpinia pyramidalis Tul.	Catingueira	18	6	1	N	NR
Erythrina velutina Willd.	Mulungu	15	5	5	N	NR
Piptadenia stipulacea (Benth.) Ducke	Calumbi-preto	13	11	1	N	NR
Capparis hastata L.	Feijão-de-boi	13	6	6	N	NR
Cordia globosa (Jacq.) Humb. Bompl. & Kunth	Maria-preta	13	7	5	N	NR
Acacia paniculata Willd.	Unha-de-gato	13	10	2	N	NR
Acacia farnesiana (L.) Willd.	Jurema-branca	12	6	7	N	R
Jatropha mollissima (Pohl) Baill.	Pinhão	12	9	4	N	NR
Guapira laxa (Netto) Furlan	Piranha	12	4	9	N	NR
Mimosa tenuiflora (Willd.) Poir	Jurema-preta	11	9	5	N	NR
Bauhinia cheilantha (Bong.) Steud.	Mororó	10	7	8	N	NR
Croton rhamnifolius Kunth.	Velame	10	9	6	N	NR
Solanum paniculatum L.	Jurubeba	8	12	5	E	NR
Ziziphus joazeiro Mart.	Juá	7	9	9	N	NR
Euphorbia tirucalli L.	Avelós	6	9	10	E	NR
Parapiptadenia sp.	Miguel-Correia	6	14	5	N	R
Crataeva tapia L.	Trapiá	6	9	10	N	NR
Myracrodruon urundeuva Allemão	Aroeira	5	11	9	N	NR
Schinopsis brasiliensis Engl.	Baraúna	5	16	4	N	NR
Anacardium occidentale L.	Caju	5	10	10	E	NR
Cedrela odorata L.	Cedro	5	10	10	N	R
Lantana camara L.	Chumbinho	5	9	11	E	NR
Albizia polycephala (Benth) Killip ex. Record	Comondongo	4	10	11	N	R
Not identified	Estralador	4	10	11	N	R
Talisia esculenta (St. Hill.) Radlk	Pitomba	4	11	10	E	NR
Eugenia uvalha Cambess	Ubaia	4	10	11	N	R
Sapium lanceolatum (Müll. Arg.) Huber	Burra-leiteira	3	13	9	N	NR
Cordia alliodora Cham.	Frei-Jorge	2	13	10	N	R
Commiphora leptophloeos (Mart.) J. B. Gillet	Imburana	2	13	10	N	NR
Lonchocarpus sp.	Rabo-de-cavalo	1	12	12	N	R
Prosopis juliflora (Sw.) DC.	Algaroba	0	14	11	E	NR
Eugenia sp.	Batinga	0	14	11	N	R
Euphorbia cotinifolia L.	Crote	0	12	13	E	NR
Eucalyptus sp.	Eucalipto	0	11	14	E	NR

Table 2 Species confused with another by at least five informants from the community of Riachão de Malhada de Pedra, Pernambuco, Caruaru, Brazil (taxonomic relations considered up to family level).

Species		Taxonomic relation
Schinopsis brasiliensis		
5 recognitions	9 confusions with *Cordia leucocephala*	No relation
***Eugenia* sp.**		
0 recognitions	5 confusions with *Eugenia uvalha*	Same genus (*Eugenia*)
Piptadenia stipulacea		
13 recognitions	11 confusions with *Acacia piauhiensis*	Same family (Mimosaceae)
Cordia alliodora		
2 recognitions	11 confusions with *Guapira laxa*	No relation
***Parapiptadenia* sp.**		
6 recognitions	5 confusions with *Acacia piauhiensis*	Same family (Mimosaceae)
Acacia paniculata		
13 recognitions	6 confusions with *Acacia piauhiensis*	Same genus (*Acacia*)

nize as its thorns leave unique vestiges on the wood samples.

Six cases were registered in which at least five informants confused one species with another (**Table 2**). Of these six cases, four involved species that were confused with other species of the same genus or family, indicating that the taxonomic proximity of these species was likewise reflected in similar morphological characteristics. For example, *Eugenia* sp. (which was not recognized by any of the informants) was mistakenly identified five times as *Eugenia uvalha* Cambess. Many informants reported that the trunks and branches of the two species were very similar in appearance, which led them to confuse the species identities. *Acacia paniculata* Willd. and *Acacia piauhiensis* Benth. were frequently confused with each other. Fully 50% of people who had confused these two species had attempted to identify them by means of their wood structure – while studies of wood anatomy of *Acacia* species have shown that this genus actually demonstrates very limited variations in its wood characteristics (Robbertse *et al.* 1980). The misidentifications that were not linked to taxonomic proximity included *Schinopsis brasiliensis* Engl., which was confused nine times with *Cordia globosa* (Jacq.) Humb. Bompl. & Kunth, mainly because both species have dark colored bark.

Bark structure was most cited by the informants as being important in wood identification, although it also pro-

Table 3 Number of recognitions and mistakes related to the characteristics cited by the informants from the community of Riachão de Malhada de Pedra, Pernambuco, Caruaru, Brazil: absolute (number of citations) and relative (percentage of recognitions and mistakes among the total citations for a given characteristic) values.

Motive	Absolute		Relative (%)	
	Recognition	Mistake	Recognition	Mistake
Wood structure	126	137	47.91	52.09
Bark structure	219	216	50.34	49.66
Smell	29	70	29.29	70.71
Taste	1	2	33.33	66.67
Vestiges of thorns or branches	46	28	62.16	37.84
Weight	39	46	45.88	54.12
Others	1	6	14.29	85.71

voked many errors (**Table 3**). But, when relatively analyzing identifications, the presence of vestiges of thorns or branches took on great importance, as 62.16% of identifications that took this criterion into account were correct. On the other hand, odor was most frequently involved in mistakes, as 70.71% of all the identification made employing this characteristic led to errors.

The total number of identifications of native species was significantly higher than that of exotic species (H=6.86; $p<0.05$), indicating a greater intimacy of the community with native resources. Another factor that influenced species identification was plant distribution – with non-restricted species being more frequently correctly identified than restricted species (H=5.64; $p<0.05$). This result may be related to the fact that not all of the informants make incursions into the forest, and even those who go there may not visit localities where these restricted species can be encountered.

All native and all non-restrict species were identified by at least one person. On the other hand, three exotic plants *Prosopis juliflora* (Sw.) DC., *Euphorbia cotinifolia* L. and *Eucalyptus* sp.) and one plant with restricted distribution (*Eugenia* sp.) were not successfully identified by any informant. If these four species were removed from the analysis, the overall recognition percentage would increase from 33.89 to 45.67%.

FINAL CONSIDERATIONS

Our findings indicate that the checklist-interview technique employed in our study can be effectively used to investigate two research parameters: the identification of locally useful species and the recognition of the most important species. Our results indicate that the most commonly identified species are those most familiar to the community, as they concentrate local attention in terms of a given usage. This finding is reinforced by the fact that people tend to more precisely recognize the species they prefer to use. We employ the term "prefer" as the conscious choice of one resource over another when both are simultaneously offered (Albuquerque *et al.* 2005a). In case the situation found in our work gets repeated in other studies, it will be possible to predict this particular group of species. Furthermore, the technique can be complementary to exploratory studies based on interviews that record the potential use of a resource.

A checklist based on woody plant part samples can be a useful tool for ethnobotanical data collection and can help lead the research into a particular sphere of the culture and provide information concerning the knowledge, use, and preference of those resources. The success of this technique, however, greatly depends on the researcher's firm knowledge of the local folk taxonomic vocabulary and the regional plants. This technique also requires a considerable investment in field time, and as such it is not suited for rapid inventories.

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