The use of visual stimuli in the recognition of plants from anthropogenic zones: evaluation of the checklist-interview method

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Abstract – Visual stimuli are being used more and more in ethnobotanical research to elicit information about the use of plants. However, the effectiveness and reliability of the information obtained through these methods are very rarely discussed in the literature. In this work, the combined use of exsiccates and photographs to collect information about the uses and vernacular names of plants from anthropogenic areas in a semi-arid area in the Northeast of Brazil was analyzed. In general, this study verified that 91% of the plants were recognized by at least one of the interviewees. However, the majority of those interviewed recognized only a small group of plants. Moreover, the recognition of a plant was not related to its local abundance.
Additional key words: Caatinga, ethnobotany, ethnoecology, human ecology.

Resumo (O uso de estímulos visuais no reconhecimento de plantas de zonas antropogênicas: uma avaliação do método checklist-entrevista) **–** Os estímulos visuais são cada vez mais usados na investigação etnobotânica para se obter dados sobre o uso de plantas. Entretanto, a eficácia e a confiabilidade dos dados obtidos com estes métodos raramente são discutidas na literatura. Neste trabalho, analisou-se o uso combinado de exsicatas e fotografias para se compilar informações sobre os usos e os vernáculos das plantas de áreas antropogênicas em uma região do Semiárido do Nordeste do Brasil. No geral, este estudo verificou que 91% das plantas foram reconhecidas por pelo menos um dos informantes. Todavia, a maioria dos entrevistados reconheceu somente um grupo pequeno de plantas. Além disso, verificamos que o reconhecimento de uma planta não está relacionado à sua abundância local.
Palavras-chave adicionais: Caatinga, ecologia humana, etnobotânica, etnoecologia.

In ethnobotanical research, visual stimuli have been employed to identify studied species and generate data with a good level of confidence (Thomas et al. 2007; Medeiros et al. 2008a,b). However, a large proportion of the studies that use this tool do not clearly define the degree of confidence, which may interfere with the recognition of the plants (either with photos, specimens or fresh material). Additionally, these reports have not discussed the efficiency or limitations of the method when applied to ethnobotanical studies, which makes it difficult to evaluate the quality of this tool and its contribution to this research (Medeiros et al. 2008a).

Many different names are attributed to the techniques that involve visual stimuli. Many times, these names take into consideration the part of the plant that is shown to the informants, the spatial context of the plant (if it is inserted in its half natural environment or collected) or the photos that are used. To standardize these terms, Medeiros et al. (2008a) proposed the utilization of the term checklist-interview for the technique that uses stimuli outside the original context of the plant, that is, plants removed from their habitat (dry or fresh parts, photographs and drawings). This denomination was adopted in the present work.

In studies with visual stimuli, the checklist-interview is the most used to gather information concerning the knowledge and use of plants. For example, using this method, Santos et al. (2009) developed a study that obtained general information about plants from anthropogenic areas in the northeast of Brazil. However, these authors used the method only to recoup the data concerning the identity and uses of these plants, and they did not cite the efficiency and implications of the method.

Few works cite the efficiency of the checklist-interview. Examples are the studies developed by Anderson & Posey (1985). Working with Kayapó Indians in the north of Brazil, these authors comment that their informants easily recognized both *in situ* and fresh plant samples. In contrast, Griffin (2001), working on an Alaskan island, reported that their informants had certain difficulty in recognizing plants, which was attributed to the plants' loss of coloration because the utilized stimuli were dry samples.

The objectives of the present study were to obtain information about the species found in disturbed environments and the degree of recognition of these plants by informants. This study sought to make the following analyses: a- to evaluate if the species most recognized by the people are the most available in the study area; b- to

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Corresponding editor: Ana Haydeé Ladio
Received: 28 Mar. 2011; accepted: 12 Oct. 2011.

verify if the number of uses of a species affects its recognition by means of the checklist-interview; and c- to evaluate the efficiency of this technique for the rapid collection of ethnobotanical information from local floristic inventories.

Material and Methods

Study area. This work was developed in the municipality of Altinho, state of Pernambuco, which is northeast of Brazil. Altinho has a territorial extension of 452.66 km^2, and according to the estimates (IBGE 2011), its population is 21,611 inhabitants; 10,542 inhabit the urban zone, and 11,069 inhabit the rural zone. Its economy is based on plant cultivation, such as sweet potatoes, cassavas, bananas, oranges, beans, maize and coffee, and upon raising cattle and/or goats (see Araújo et al. 2008; Santos et al. 2009). However, the predominant activity, which employs a large part of the population, is production of crafts (IBGE 2011).

In the city of Altinho, the community of Carão was selected to carry out this research. This community is located in the rural zone and has 189 inhabitants that are distributed over 61 residences. The main economic activity of this community is subsistence agriculture and raising cattle and goat livestock (Araújo et al. 2008). The characteristic vegetation of the region is caatinga (dry land), and the area has a hot semi-arid climate, an average temperature greater than 26ºC and a great irregularity in rainfall (IBGE 2011). Visually different vegetation structures can be distinguished and vary between herbaceous-subshrub elements (lower areas, modified for man) and denser vegetation with bush-tree elements from the “foot of the mountain” through all of its extension. More details about the region, from the ethnobotanical point of view, can be found in the works of Araújo et al. (2008), Alencar et al. (2009, 2010), Santos et al. (2009) and Lins-Neto et al. (2010).

Collection of ethnobotanical data. Initially, to expound the research objectives, a general meeting was held at the Carão Inhabitants Association. Once given their permission to begin the study, each person was asked to sign the Free and Clarified Consent Form, always observing the ethical aspects of the research involving human beings (National Health Council, Resolution 196/96). Of the 189 people who inhabit the community, 112 agreed to participate in the research (see Araújo et al. 2008).

The first stage of the work consisted of completing a semi-structured general interview with each informant that agreed to participate in the research. In this stage, the people reported the respective uses of all the plants that they knew from the region, such as medicinal, nourishment, lumber, ornamental and forage among others, in all the environments of the community, not only in the anthropogenic zones. This initial recognition of plants and their uses was done through interviews with all members of the community, older than 18 years.

In the second stage, 14 informants were intentionally selected. The criterion for selection was people who had cited a greater quantity of plants and uses during the general interviews. At the end of each interview, the “snow ball” method was used (e.g., Albuquerque et al. 2008). Each of the specialists indicated people whom they judged to have great knowledge about the plants from the locality, and this sample was closed when no new names were indicated. With the “snow ball”, only one more interviewee was added, totaling 15 key informants. With these 15 inhabitants, the checklist-interview method for the collection of ethnobotanical data was used on the plants that grow in anthropogenic areas. This method consisted of the application of visual stimuli to obtain information on the use and knowledge of the plants from the region (Medeiros et al. 2008a).

To apply the checklist-interview method, it was necessary to first carry out a floristic inventory to obtain the list of species that occur in the anthropogenic areas of this community (see Santos et al. 2009). The total number of plants sampled in this inventory was high (119 species), which would make the application of the checklist tiring for the informant. Thus, it was necessary to cut down the list to only species that had more than 10 individuals in the 300 sampled parcels (1 m × 1 m). A total of 67 species met this criterion; for each of these, 32 cm in length by 21 cm in width field specimens were mounted. The “field herbarium”, constituted by the specimens numbered from 1 to 67 (preferential the flowering and fruit bearing ones) along with the photos of the same stored in a notebook, was presented to the informants (Figure 1). Afterwards they were asked the following questions: Do you know this plant? What is its name? Does it have a use?

Data analysis. To analyze the level of plant recognition by the informants (n = 15), the following categories were considered: 1- plants with high recognition: identified correctly by 15 to 11 informants; 2- plants with average recognition: identified correctly by 10 to 6 informants; 3- plants with low recognition: identified by 5 to 1 informants; and 4- unknown plants: unidentified by the informants.

To compare the level of recognition by the informants, each one of these were distributed in the following classes: class 1 (recognized between 0 to 25% of the plants presented in the checklist); class 2 (26–50%); class 3 (51–75%); and class 4 (76–100%) (Medeiros et al. 2008b). To verify if a relationship between species recognition and its availability in the anthropogenic zones, the Spearman correlation test was used (Ayres et al. 2007).

Figure 1. Application of the checklist-interview method in a rural community of Altinho city (Pernambuco, northeastern Brazil): **A–B-** field herbarium; **C–D-** photos and exsiccates presented to the informants.

Results and Discussion

Of the 67 species presented to the key informants during the checklist-interview, 18 plants were "highly recognized", while the majority presented "low recognition" by the informants (24 species), and six were totally unknown (Figure 2). Among the most recognized species were *Bidens bipinnata* L. (popular name: carrapicho – uses: forage, medicinal), *Libidibia ferrea* (Mart. ex Tul.) L.P.Queiroz (jucá – forage, medicinal, lumber), *Poincianella pyramidalis* (Tul.) L.P.Queiroz (catingueira – medicinal, lumber, aphrodisiac), *Mentzelia aspera* L. (pega-velho – forage) and *Solanum agrarium* Sendth. (gogoia – forage, medicinal, nourishment) (recognized by 100% of those interviewed); followed by *Acanthospermum hispidum* DC. (má-vizinha – forage, medicinal), *Ageratum conyzoides* L. (mentrasto – fodder plant, medicinal, organic fertilization), *Urochloa plantaginea* (Link) R.D.Webster (miã – forage), *Portulaca oleracea* L. (bredoégua – forage, medicinal) and *Senna obtusifolia* (L.) H.S.Irwin & Barneby (mata-pasto – fodder plant, medicinal) with 14 recognitions; and *Dactyloctenium aegyptium* (L.) Willd. (mão-de-sapo – forage), *Indigofera suffruticosa* Mill. (forage; toxic in excess) and *Lantana camara* L. (chumbinho – forage, medicinal, nourishment) with 12 recognitions (Table 1). All species listed, except catingueira, were indicated for forage use.

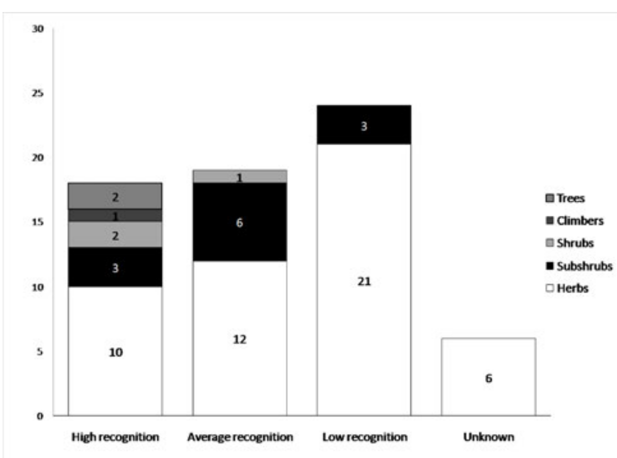

Figure 2. Recognition of species found in anthropogenic areas in the municipality of Altinho, Pernambuco, northeast of Brazil.

The referring checklist-interview contained only 67 species that had occurred with greatest abundance in the floristic inventory completed in the anthropogenic zones, and we observed that only 12 species that occurred in the inventory were cited in the general interviews, demonstrating that the plants are not recognized by visual stimuli are unknown by the people and did not appear in the general interview. As expected, the majority of plants that were common to the two collection methods were high recognition species (7 species), suggesting that they constitute a group of more popular plants.

It is thought that the anthropogenic areas include a great diversity of plants that are rarely captured by means of the usual methods of semi-structured interviews, and such results can lead to different interpretations: 1- this species is not perceived by the population as a useful resource, although it is available and abundant in the area at least during the rainy season (in the case of the herbaceous plants); and 2- the little knowledge regarding these species reflects the small importance they have for the population, which is possibly due to their low recognized use potential by the community, making the incorporation of these species in the dynamics of the local knowledge impossible.

The herbs represented the most abundant form of life in the anthropogenic zones, and they also constituted a large part of the species used in the checklist-interview (73%); thus, it would be reasonable to expect that they would be well-represented in all levels of recognition (see Figure 2). However, it is noteworthy herbaceous plants stood out as the group of plants recognized by few people and were the only plants with representatives in the "unknown" category.

Although 91% of the plants were recognized by at least one of the informants, the average recognition was 45.07% of the plants (Standard Deviation = 10.98). The majority of those interviewed were in class 2 (8 informants), which demonstrates a low level of species recognition. Only one informant, who recognized 62.68% of the species that were presented, was in class 4. In a study developed in the city of Caruaru, which is next to the region where this research was conducted, Medeiros et al. (2008b) applied the checklist-interview technique with firewood users, using pieces of branches and trunks as visual stimulation. These authors found an average recognition of approximately 34% of the plants and recorded that the majority of the informants were also grouped in class 2.

Table 1. Identification of the samples of 67 species used in the checklist-interview in the rural community of Carão, municipality of Altinho (Pernambuco, northeast of Brazil) by 15 specialists. Rec = Recognition, Equ = Mistake, Abs = Abstention, Use = already use the plant and Sub = a substitute for the plant in question.

Species	Popular name	Rec	Equ	Abs	Use	Sub
Bidens bipinnata L.	carrapicho	15	0	0	5	Yes
Libidibia ferrea (Mart. ex Tul.) L.P.Queiroz	jucá	15	0	0	9	Yes
Poincianella pyramidalis (Tul.) L.P.Queiroz	catingueira	15	0	0	12	Yes
Mentzelia aspera L.	pega-velho	15	0	0	0	No
Solanum agrarium Sendth.	gogoia	15	0	0	9	Yes
Acanthospermum hispidum DC.	má-vizinha	14	0	1	4	Yes
Ageratum conyzoides L.	mentrasto	14	0	1	5	Yes
Urochloa plantaginea (Link) R.D.Webster	miã	14	1	0	11	No
Portulaca oleracea L.	bredoégua	14	1	0	13	Yes
Senna obtusifolia (L.) H.S.Irwin & Barneby	mata-pasto	14	0	1	0	Yes
Dactyloctenium aegyptium (L.) Willd.	mão-de-sapo	12	0	3	11	No
Indigofera suffruticosa Mill.	anil	12	1	2	0	No
Lantana camara L.	chumbinho	12	1	2	6	Yes
Schultesia guianensis (Aubl.) Malme	cama-de-gia	12	0	3	0	No
Setaria parviflora (Poir.) Kerguélen	capim	11	1	3	11	No
Cyperus uncinulatus Schrad. ex. Nees	barba-de-bode	11	0	4	9	No
Melanthera latifolia (Gardner) Cabrera	mal-me-quer	11	0	4	3	No
Passiflora foetida L.	maracujá-de-estralo	11	0	4	3	Yes
Blainvillea acmella (L.) Philipson	aivanço	10	0	5	7	No
Eragrostis ciliaris (L.) R.Br.	capim-mimoso	10	1	4	8	No
Commelina benghalensis L.	andacá	10	3	2	2	No
Diodia teres Walter	erva-de-ovelha	10	1	4	3	No
Senna occidentalis (L.) Link	manjiroba	10	1	4	5	Yes
Centratherum punctatum Cass.	perpétua	9	3	3	1	No
Cyperus distans L.f.	capim-navaeiro	9	0	6	1	No
Eleusine indica (L.) Gaertn.	capim-pé-de-galinha	9	2	4	5	No
Staelia aurea K.Schum.	vassourinha	9	0	6	1	Yes
Cyperus sp.	capinzinho	8	0	7	0	No
Paspalum scutatum Nees ex Trin.	capim	8	0	7	8	No
Solanum americanum Mill.	erva-moura	8	0	7	5	Yes
Heliotropium angiospermum Murray	fedegoso	7	0	8	7	No
Herissantia crispa (L.) Brizicky	mela-bode	7	1	7	5	No
Polygala paniculata L.	chave	7	0	8	5	Yes
Desmanthus virgatus (L.) Willd.	cortiça	6	2	7	0	No
Ocimum campechianum Mill.	alfavaca	6	3	6	4	Yes

Anthephora hermaphrodita (L.) Kuntze	capim-de-flexa	6	0	9	8	No
Sida spinosa L.	relógio	6	1	8	4	Yes
Sida cordifolia L.	-	5	1	9	0	No
Rhyncosphora contracta (Nees) Raynal	mato-de-alagado	5	2	8	0	No
Waltheria rotundifolia Schrank	malva-branca	5	0	10	1	Yes
Phyllanthus heteradenius Müll. Arg.	quebra-pedra	4	0	11	1	Yes
Ruellia geminiflora Kunth.	quexadinho	4	0	11	0	No
Alternanthera tenella Colla	espinho-de-padre	3	1	11	4	No
Chamaecr ista pilosa (L.) Greene	canafista	3	0	12	2	No
Leucas martinicensis (Jacq.) R.Br.	cordão-de-frade-miúdo	3	3	9	0	No
Ludwigia octovalvis (Jacq.) P.H.Raven	pimenta-d'água	3	3	9	0	No
Portulaca sp.	coqueirinho	2	2	11	4	No
Angelonia pubescens Benth.	orelha-de-rato	2	0	13	2	No
Chamaecrista rotundifolia Greene var. rotundifolia	urinana	2	2	11	2	Yes
Chamaesyce hyssopifolia (L.) Small	leite-de-soldado	2	2	11	2	No
Gnaphalium spicatum Lam.	fumo-brabo	2	1	12	1	No
Mollugo verticillata L.	estreladinho	2	0	13	1	No
Stylosanth es guianensis (Aubl.) Sw	vassoura	2	0	13	2	Yes
Callisia filiformis (M.Martens & Galeotti) D.R.Hunt	marmelada	1	1	13	1	No
Croton hirtus L'Hér.	muquim	1	3	13	0	No
Euphorbia comosa Vell.	leite-de-porca	1	0	14	0	No
Hyptis sp.	alfazema	1	5	9	1	No
Oxalis divaricata Mart. ex Zucc.	azedinho	1	1	13	0	No
Polygala violacea Aubl.	-	1	1	13	0	No
Stylosanthes scabra Vogel	vassoura	1	0	14	1	Yes
Turnera sp.	hortelã-braba	1	0	14	1	Yes
Corchorus hirtus L.	-	0	0	15	0	No
Croton glandulosus L.	-	0	1	15	0	No
Delilia biflora (L.) Kun tze	-	0	0	15	0	No
Evolvulus filipes Mart.	-	0	0	15	0	No
Marsypianthes chamaedris (Vahl) Kuntze	-	0	0	15	0	No
Zornia latifolia Sm.	-	0	0	15	0	No

There was no significant relationship between the number of people who recognized a species and its availability in the studied environments ($p > 0.05$, rs = -0.21), that is, the plants more easily recognized by the informants are not the most abundant in the area. However, there was a significant relationship between the number of recognitions and the amount of times the informants claimed they used the species ($p < 0.0001$, rs = 0.58), suggesting that by being manipulated with greater frequency, the most-used species are also more recognized. Medeiros et al. (2008b) reported that species identified with greater frequency are possibly those that people are more familiar with because people tend to recognize with greater precision the species that they prefer to use in their day-to-day activities.

During the development of this research, we perceived important questions referring to the recognition of the species. In particular, it was common to hear expressions that emphasized the low importance of the herbaceous plants found in the anthropogenic zones. For instance: *"Where did you get this bush? This is only good for animals to eat."* These affirmations corroborate the aforementioned findings that herbaceous plants are not well recognized by or are completely unknown to the population (Figure 2).

In regards to the visual stimuli used in this research, the majority of the specialists (53.33%, n = 8) were better at recognizing the plants by looking at the photos instead of the dried samples of the "field herbarium". This was because the photos, according to local specialists, were more realistic, as the colors and the formats were maintained in the images. In addition to the contextualization in relation to their environment, the dry plants also lost important characteristics such as coloration. For the other informants (46.66%), observing the photos and the dry plants jointly was better for the recognition of the species.

In contrast to this study, in which the key informants reported not having difficulties recognizing the species through photos, in the study of Monteiro et al. (2006), the use of photos was not satisfactory, and less than 5% of the analyzed medicinal plants were recognized by the informants. For this reason, the authors did not take this method forward.

For the present work, the use of visual stimuli was an important tool for understanding how people recognize the plants around them. We often observed that the informants succeeded in recognizing determined species by the presence of thorns (when touching the specimen), or they confirmed the identity of a determined plant after analyzing the photos and perceiving the colors and forms of the flowers and fruits. However, it is necessary to mention that this method was applied only with local specialists (key informants), which suggests that the use of this method may not reach the same conclusions if it was applied in the general community.

Studies that use visual stimuli must concentrate on efforts to unite two or more stimuli (e.g., specimens and photographs); thus, there will be a greater possibility of identification, permitting a greater probability of species recognition (Case et al. 2005, 2006). This study strengthened this idea. When informants were not able to identify the plant by observing the specimen, the photos could overcome this deficiency.

For a reliable identification of the plants, a good knowledge of the local taxonomical terms is necessary, which minimizes the possibilities of mistaken identifications (Medeiros et al. 2008b). During the interviews, when the people said the popular name of the plant in question, we always asked if another "type" of plant with the same name exists in the locality. Additionally, it is important to identify if the people attribute different names to the same plant, which will reduce the possibilities of the interviewer speaking about one plant and the informant speaking about another. This requires a greater period of fieldwork to gain a greater knowledge of the informant and the environment in study.

Visual stimuli can collaborate to recoup information of a large diversity of plants that are generally not remembered by people during the application of the usual interview methods (see Thomas et al. 2007). General interviews tend to identify species that are more visible and present in the informant's day-to-day life, which makes it difficult to obtain a real list of all the useful species of a determined region. Therefore, the role of visual stimuli is highlighted here as a technique to overcome this limitation presented by general interviews and we specifically highlight the importance of this technique to collect data about native herbaceous species.

Some of the species collected in this work, such as the jucá (*Libidibia ferrea*) and the catingueira (*Poincianella pyramidalis*), are widely known and used by the populations of northeastern Brazil. However, there is little ethnobotanical knowledge in the literature about the plants collected with the use of the visual stimuli, and they are perceived by the local population as species with little value, mainly because a large part of these plants are only useful for forage. The informants' dialogue showed that an evident trend that they devalue plants with this use.

Acknowledgements

The authors thank the Carão community for their receptivity and participation, those responsible for the administration of Altinho city, the National Council for Scientific and Technological Development (CNPq) for financial support ("Edital Universal") and productivity grant to U.P. Albuquerque, Dra. Maria Franco Trindade Medeiros for the comments and suggestions, and members of the Laboratório de Etnobotânica Aplicada for the help with the fieldwork – especially to Ana Carolina O. da Silva, Cybelle Maria de Albuquerque Almeida, Fábio José Vieira, Flávia dos Santos Silva, Gustavo Taboada Soldati, Henrique Hermenegildo, Joabe Gomes de Melo, Luciana Gomes de Sousa Nascimento, Nélson Leal Alencar, Shana Sampaio Sieber and Thiago Antônio de Souza Araújo.

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