

Use of Participatory Methods in the Creation of a Catalog of Medicinal Plants

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ABSTRACT

Participatory methods are currently used in different research areas, especially for the rapid diagnosis of the needs of people involved in the study. Thus, these methods were used in an extension project carried out in the Carão community, located in the city of Altinho in the arid zone of Pernambuco (Northeastern Brazil), in an area of Caatinga. A catalog of medicinal plants native to the Caatinga was needed by the community and generated through participatory methods. The need for this catalog arose from the desire to know the useful flora of the area and to maintain a record of the traditional medical practices of the community. Species with a greater number of medicinal and therapeutic uses, totaling 30 woody species, were selected based on a survey previously conducted. These species were photographed, with an emphasis on plant habitat and details of the leaves, flowers and fruits. Two workshops were carried out with the participation of about 30 residents, who were divided into three groups. On these occasions, we presented names and pictures of each plant, and the residents discussed their medicinal uses, including which plant parts were used in the preparation of the medicine and how the medicine was prepared and administered. The information gathered from the workshop participants was cataloged and organized so that each plant had a brief description, an illustration and information on its common uses. The compilation of this catalog was a way of valuing and recording the local knowledge of medicinal plants and the local medical practices.

Keywords: caatinga, ethnobotany, extension, participatory methods, return

INTRODUCTION

Large areas of vegetation, especially in tropical regions, have been devastated over time, causing drastic changes in habitat structure (Cunningham 1993; Albuquerque *et al.* 2005). This destruction is frequently found in the semi-arid region of Brazil, especially in the Caatinga, where areas covered by native vegetation have suffered from human actions and have been replaced by crops and grazing areas (Sampaio 1995; Araújo *et al.* 2007). Thus, the local availability and diversity of native species, some of which are endemic to these environments, are reduced by those alterations to the environment (Sampaio 1995, 2002).

On the other hand, human actions that directly affect the environment cannot be seen only as negative actions because people are part of the system and establish relationships with the environment (Araújo *et al.* 2007). Some cases such as that of the black fern (*Rumohra adiantiformis* (G. Forst) Ching), have demonstrated that the commercial use of a species can drastically reduce its population size, but the implementation of appropriate management systems have been able to reverse the situation.

In this sense, as an alternative for understanding how people recognize the environment to which they belong and make use of locally available resources, many times in an unconscious and indiscriminate way, the use of participatory methods in ethnobiological studies has grown over time and become an important tool in these studies (Sieber *et al.* 2010; Sieber and Albuquerque 2010). Participatory methods allow local residents to express their opinions to researchers and receive guidance on how to deal sustainably

with the resources available in the environment. Researchers aim for the residents to understand the local reality and participate in decision making in their communities (Geilfus 1997).

Thus, local participation is very important for understanding and diagnosing local problems, reflected in environmental issues, and planning conservation strategies to preserve these plant resources in the environment and enhance the quality of life for the people who use them.

According to Siliprandi (2002), activities aimed at rescuing traditional knowledge, especially of medicinal plants, have emerged as a major theme during a series of changes in the way of thinking and acting on the rural environment. The development of these activities has helped restore the dignity and self-esteem of the populations.

This study aims to describe the importance of local community participation in developing a catalog of medicinal plants of the caatinga, based on information obtained through participatory methods. We also tried to record the strong pressure of use that the native species have undergone, highlighting the importance of dialog between researchers and residents to devise strategies that address the continuity of medicinal practices with the best-known and most-used local species.

MATERIALS AND METHODS

Study area

This study was developed in the rural zone of the city of Altinho (08° 29' 23" S and 36° 03' 34" W), located in the central arid zone

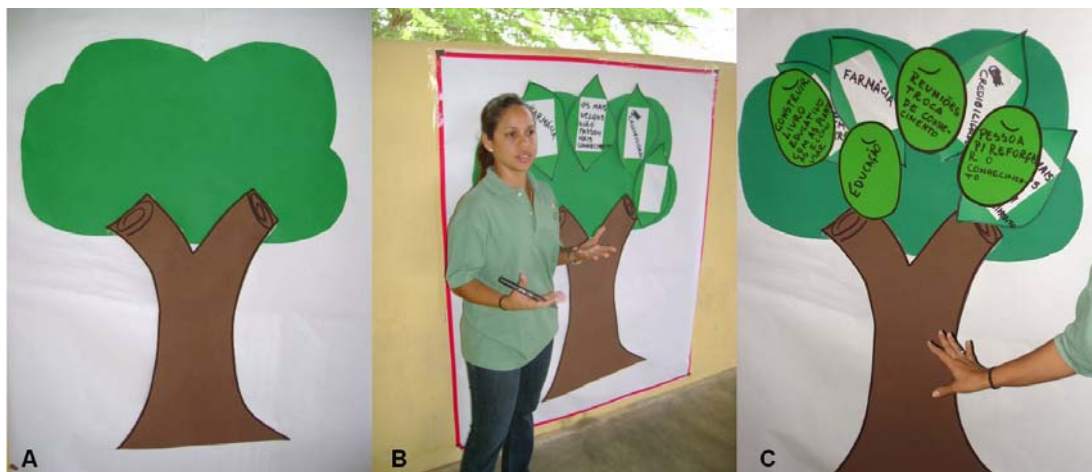


Fig. 1 (A) *Spondias tuberosa* Arruda (umbu), a species widely known by the residents of Carão community in Altinho, Pernambuco, Brazil, was represented in the “problem tree” technique adapted from Geilfus (1997) (B) the problems found were written on leaves and (C) the solutions offered were written on fruits.

of Pernambuco state, in the microregion of Brejo Pernambucano, in the northeastern part of Brazil (FIDEM 2008). This region is characterized by Caatinga vegetation, a hot, semi-arid climate (Bshs'), an average temperature above 26°C, and very irregular rainfall (IBGE 2008). According to the IBGE census (2010), the city has 22,347 inhabitants.

The community of Carão is located 16 km from the center of the city, and has a population of 189 inhabitants who live mainly from subsistence agriculture, complemented by cattle and goat husbandry. The central area of the community includes most of the 61 homes. The community has Catholic and evangelical Christian churches, and the vast majority of the residents are Catholic.

The community is assisted by the Family Health Program (FHP), which has a doctor and a nurse who make monthly visits. There is also a health facility with one nurse technician, who takes care of the simplest cases. Cases that require further attention are forwarded to the city's hospital.

The community has a one-room elementary school, and children must move to the city to complete their studies. All the houses are made of brick and have electricity, but their water is supplied by capturing rainwater via tanks and/or small dams (Alencar 2008; Araújo *et al.* 2008; Lins Neto 2008).

Species selection

Medicinal species of tree or shrub size that occur spontaneously or are native to the Caatinga and that have been mentioned more frequently by the community of Carão in a previous study (Albuquerque *et al.* 2010a) were selected. For this selection, a database previously produced by researchers of the Laboratory of Applied Ethnobotany (LEA) that conducted a survey on the knowledge and use of plants in the community of Carão was analyzed.

This study is part of an extension project titled *Medicinal Plants and Popular Medicinal Practices in the Caatinga – Environmental and Cultural Sustainability* (April/2008 – December 2009), developed by researchers of Universidade Federal Rural de Pernambuco. This project originated from the needs and aspirations of residents of a rural community, previously diagnosed by a team of researchers from the same institution, who worked in the area from 2006 to 2009.

Workshop on the problematization and creation of the catalog of medicinal plants

Semi-structured interviews were carried out (Albuquerque *et al.* 2010b) with residents of the community to understand the needs and practices related to plant resources with medicinal usefulness. The interview process provided an opportunity to get to know the community and become closer to the residents.

Then, a *problematization* workshop was carried out to promote debate and bring about solutions to the problems identified in relation to the extraction, preparation and uses of medicinal plants.

To achieve these goals, a two-stage approach was used. The first stage consisted of a technique called “problem tree” (Fig. 1) adapted from Geilfus (1997) that aims to help researchers and the community understand the problems and identify their causes and effects.

The tree was represented by the most popular species of the community, the umbuzeiro (*Spondias tuberosa* Arruda), and the problems were written on its leaves. For this workshop, the participants were divided into two groups. As solutions were developed and discussed, they were added to the tree as its fruits (umbu).

In the second stage of the workshop, the participants were divided into three groups through a game with colorful balloons that were given to the participants. The game started with a song, and everyone subsequently popped their balloons and formed groups according to the numbers (1, 2 or 3) inside their balloons. Each of these groups was then given 10 cards with names and pictures of species, 30 species in total. The extraction, parts used, preparation techniques and administration of each species were discussed. We also tried to assess the challenges and opportunities of management and availability of each species.

RESULTS AND DISCUSSION

Selected species and availability in the community

A total of 30 medicinal species most frequently mentioned by the residents of the Carão community were selected (Table 1). Following a trend observed among the native plants of the Caatinga (Albuquerque and Andrade 2002), there was a direct relationship between the number of uses assigned to the plant and its citation, i.e., species that had the greatest number of citations of use also had the largest number of therapeutic indications. Aroeira (*Myracrodruon urundeuva*) is highlighted in the list, both by the citations of use (130 citations) and by the therapeutic indications (36 nominations). Imburana-açu (*Amburana cearensis*), which had the second most citations, had the third highest number of therapeutic indications, with 22 nominations, behind jucá (*Libidibia ferrea*), which obtained 32 therapeutic indications and 78 use citations (Table 1).

Although this information is not contained in the catalog, during the problematization workshop, information on local availability of plants included in the catalog was generated.

According to the data collected from the residents, the vast majority of species are abundant; however, the data indicated a reduction in the availability of the following species: *Handroanthus impetiginosus* (pau d'arco-roxo), *Cedrela odorata* (cedro), *Amburana cearensis* (imburana-açu), *Libidibia ferrea* (jucá), *Jatropha curcas* (pião-manso) and *Mimosa tenuiflora* (jurema-lisa). *Coutarea hexandra* (quina-quina) and *Sideroxylon obtusifolium* (quixaba) were

Table 1 Medicinal plants selected for the workshops in the Carão community in Altinho, Pernambuco, Brazil. Legend: N caa – native to the Caatinga; N end – native endemic and N w – native with wide distribution (spontaneously present in Brazilian ecosystems).

Plant	Scientific Name	Family	Size	Origen	therapeutic	Citations
Imburana-açu	<i>Amburana cearensis</i> (Allemão) A. C. Sm.	Fabaceae	tree	N caa	22	95
Angico	<i>Anadenanthera colubrina</i> (Vell.) Brenan	Fabaceae	tree	N caa	20	57
Mororó	<i>Bauhinia cheilantha</i> (Bong.) Steud.	Fabaceae	shrub	N w	14	26
Jucá	<i>Libidibia ferrea</i> (Mart. ex Tul.) L. P. Queiroz	Fabaceae	tree	N end	32	78
Catingueira	<i>Poincianella pyramidalis</i> (Tul.) L. P. Queiroz	Fabaceae	tree	N end	17	73
Cedro	<i>Cedrela odorata</i> L.	Meliaceae	tree	N caa	14	20
Mandacaru	<i>Cereus jamacaru</i> DC	Cactaceae	shrub	N caa	8	12
Jurema branca	<i>Chloroleucon extortum</i> Barneby & J.W. Grimes	Fabaceae	tree	N	5	18
Urtiga	<i>Cnidioscolus urens</i> (L.) Arthur	Euphorbiaceae	shrub	N caa	6	7
Imburana	<i>Commiphora leptophloeos</i> (Mart.) J.B.Gillett	Bursaraceae	tree	N end	12	17
Quina quina branca	<i>Coutarea hexandra</i> (Jacq.) K. Schum.	Rubiaceae	tree	N w	10	11
Trapiá	<i>Crataeva tapia</i> L.	Capparaceae	tree	N caa	4	4
Rama branca	<i>Croton argyrophylloides</i> Müll. Arg.	Euphorbiaceae	shrub	N caa	11	33
Marmeleiro	<i>Croton blanchetianus</i> Baill.	Euphorbiaceae	shrub	N caa	11	40
Velame	<i>Croton rhamniifolius</i> Willd.	Euphorbiaceae	shrub	N caa	18	39
Mulungu	<i>Erythrina velutina</i> Willd.	Fabaceae	tree	N caa	12	23
Ubaia	<i>Eugenia uvalha</i> Cambess.	Myrtaceae	shrub	N caa	1	5
Piranha	<i>Guapira laxa</i> (Netto) Furlan	Nyctaginaceae	shrub	N w	6	34
Jatobá	<i>Hymenaea courbaril</i> L.	Fabaceae	tree	N w	15	44
Pião manso	<i>Jatropha curcas</i> L.	Euphorbiaceae	shrub	N w	9	16
Pião bravo	<i>Jatropha mollissima</i> (Pohl) Baill.	Euphorbiaceae	shrub	N caa	10	62
Bom nome	<i>Maytenus rigida</i> Mart.	Celastraceae	tree	N end	16	51
Jurema preta	<i>Mimosa tenuiflora</i> (Willd.) Poir.	Fabaceae	tree	N caa	13	42
Aroeira	<i>Myracrodruon urundeuva</i> Allemão	Anacardiaceae	tree	N caa	36	130
Baraúna	<i>Schinopsis brasiliensis</i> Engl.	Anacardiaceae	tree	N end	13	19
Espinheiro vermelho	<i>Senegalia bahiensis</i> (Benth.) Seigler & Ebinger	Mimosaceae	tree	N caa	2	2
Quixaba	<i>Sideroxylon obtusifolium</i> (Roem. & Schult.) T. D. Penn.	Sapotaceae	tree	N caa	6	22
Umbu	<i>Spondias tuberosa</i> Arruda	Anacardiaceae	tree	N end	15	22
Ipê roxo	<i>Handroanthus impetiginosus</i> (Mart. ex DC.) Mattos	Bignoniaceae	tree	N w	8	20
Juazeiro	<i>Ziziphus joazeiro</i> Mart.	Rhamnaceae	tree	N end	14	93

the species that were considered the most difficult to find. Only two individuals of *Sideroxylum obtusifolium* are registered in the community.

Learning the residents' perceptions of the availability of local species through the workshop was highly relevant. The availability data reinforce the importance of the species in the catalog and warn the local population of the need for their conservation. In addition, the information about these plants was recorded for access by future generations. In this way, the catalog may contribute to the maintenance of the knowledge about these medicinal plants.

Therefore, information from the local population shows the relevance of studies about native Caatinga species at the community level for future conservation efforts that will actively involve the community (Oliveira *et al.* 2007).

Interviews and workshops

A total of 91 adults were interviewed (82.14% of the residents of the community). These interviews enabled us to identify the main problems regarding the use of medicinal plants in the Carão community. These problems include the lack of interest of young residents in knowing the therapeutic uses of these resources; retention of knowledge by some people who, for different reasons, do not share their knowledge and practices concerning the use of medicinal plants; better access to allopathic medicines; and less credibility of the use of medicinal plants (Albuquerque *et al.* 2010a).

Solutions to and/or suggestions for these problems arose from the problematization workshop, in which 26 residents divided into two groups participated (Fig. 2). The solutions identified were as follows: start the rescue of the culture inside the household; grow medicinal plants at home; hold frequent meetings to exchange knowledge among community members; preserve nature to maintain availability of the resources; promote lectures by researchers to bring back credibility on the use of medicinal plants, enhancing traditional knowledge; and develop a

catalog explaining the uses and administration of medicinal resources.

Thus, with the use of participatory methods, it was possible to find, jointly with residents, solutions that meet local needs, mainly related to the preservation of the knowledge concerning the use of medicinal plants. A catalog of basic information was needed to store local knowledge about these species.

Thus, the interviews and participatory workshops were an important step in this project, both because of the dynamics throughout the process (Santos *et al.* 2005) and because they opened lines of communication between the researchers and the community, as well as among community members (Geilfus 1997). Community members began to recognize and value their knowledge by sharing it with others. The researchers acted only as facilitators and moderators of a collective construction process by organizing the discussions to keep the goals in perspective (Sieber and Albuquerque 2010).

Catalog creation

The catalog lists the 30 most-cited plants that occur spontaneously or are native to the Caatinga and have popular indications of medicinal use (Fig. 3). Each plant was briefly described and illustrated with pictures (habit, flowers, fruits), as well as with information on its popular uses (Fig. 4).

Additionally, information on the importance of properly storing the plant parts was included, since proper storage is a crucial factor for the efficacy of the medicines (Pinto 2008). Moreover, different methods of preparing the plants as teas, liquors, potions, sauces and juices were emphasized.

To call attention to the indiscriminate use of any substance, the material also includes an important recommendation: "Never use a plant without knowing its uses and without being sure of its identification, and in case of doubt on the plant "identification and effectiveness", always seek an expert on the subject or a technician from the closest



Fig. 2 First stage of the problematization workshop. (A) debate with work group (B) resident showing his opinion on the problem tree (C) solutions identified by the community in a participatory way (D) presentation of solutions suggested by community members.

University in the region”.

The use of pictures in the catalog aids in the recognition of the medicinal species considered most important by the community. These pictures will be especially helpful for young residents, who did not seem interested in acquiring the knowledge from their peers. With these images, young residents can recognize new species and consequently increase their knowledge about those species. The catalog will also contribute to the spread of knowledge on the species listed within it. Moreover, the pictures will allow young residents to perceive some details that were not noticed in the field. According to Falcão and Gilbert (2005), readers can efficiently use pictures to express their experiences on a subject. Taking this into consideration, a place for taking notes is included after each plant’s images, description and local uses. Readers can use this space to summarize or add information about each species.

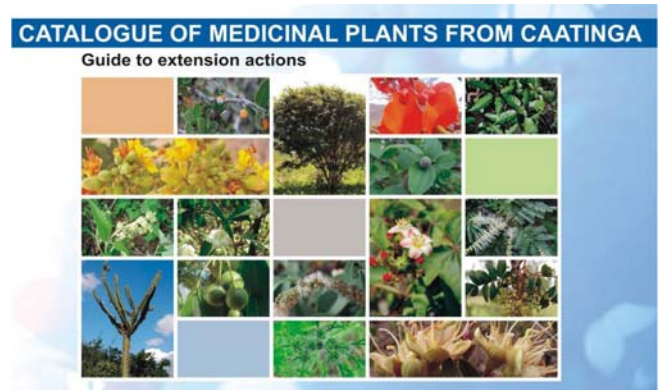


Fig. 3 Cover of the catalog of medicinal plants, created from the information acquired in Carão community of Altinho, Pernambuco, Brazil. The catalogue is freely available in PDF format online.

Benefits to the community

The concern about giving back to the community for its help in the research is a recurrent concern for researchers who work directly with traditional communities. This concern was reinforced in 1992 with the promulgation of the *Convention on Biological Diversity (CBD)* signed at the time by 162 countries, including Brazil (Albagli 2006). Among the obligations set out in the CBD, the countries should engage in three primary goals: 1. conservation of biological diversity; 2. sustainable use of natural resources; and 3. sharing the benefits derived from the use of these resources (Albagli 2006). The third goal is still frequently discussed among different political, academic and social institutions because often the “return” or “benefit sharing” (which does not need to be financial) is not fulfilled by the researchers because they simply do not know how to do it (Kageyama 2005; Albuquerque *et al.* 2010c).

According to Kageyama, former director of Biodiversity of the Ministry of Environment (Brasília, DF) the best way to value traditional knowledge and share the benefits with small communities, who are usually responsible for biodiversity conservation, would be through guidance and policy development aimed at the direct use of these resources by the community itself. For this purpose, Kageyama (2005) highlights as the main tool a type of research similar

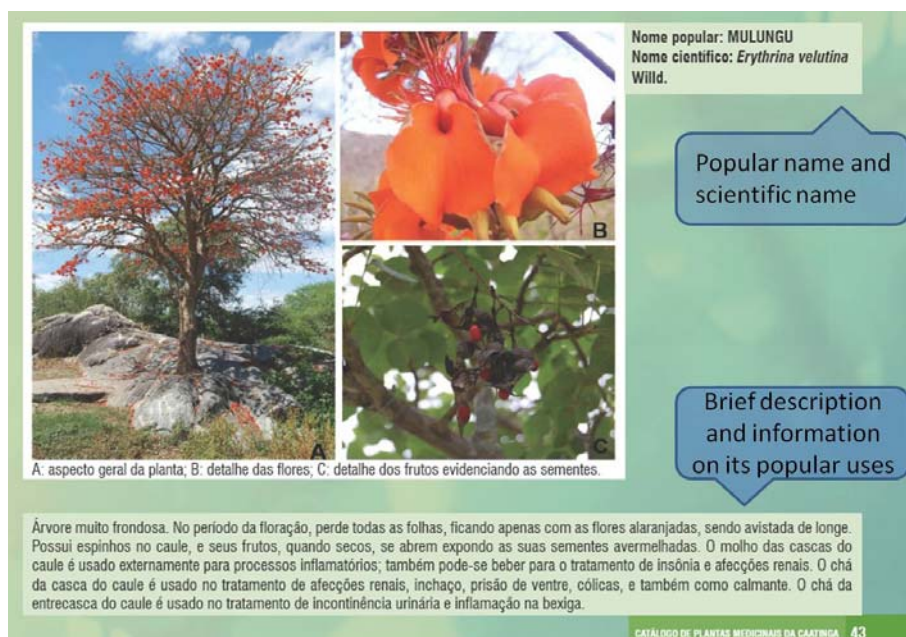


Fig. 4 Structure of the catalog of medicinal plants, created from the information acquired in the Carão community of Altinho, Pernambuco, Brazil.



Fig. 5 Distribution of the catalog and other products to residents of the Carão community. (A) leaders of the extension project displaying the materials (B) presentation of the material to the community (C) residents looking at the material and (D) delivery of the material to the homes of residents who could not attend the launch event.

to that described in this article, based on participatory methods, saying, “*Through the interaction of scientific and traditional knowledge, it is possible to build a new type of knowledge, based on individual respect*”.

In this sense, the “return” or “benefit sharing” with Carão community consisted of an evening event to launch the products derived from the research (Fig. 5A) (Web-site 1). This event was attended by 80% of the community residents as well as political leaders and guests from neighboring communities. Among the products presented on this occasion, we highlighted the presentation of *Catalog of Caatinga Medicinal Plants* because the research participants could recognize themselves as collaborators.

The fact that residents of Carão recognized themselves as collaborators in the process enhances the relationship between the researchers and local experts. As Posey (1986) noted, when information on determined uses is collected, the informants want to be respected as experts on the subject in the same way that we respect experts from our own culture.

After the presentation of the catalog (Figs. 5B, 5C), in which the content was briefly explained, there was a small reception. During the reception, the community members shared the information contained in the catalog among themselves, including with children and teenagers who previously had no interest in this local knowledge.

During the event that marked the “return” to the community, people demonstrated their satisfaction at seeing the results of the research with emotional testimonies. The teacher of Carão school group said, “*When you arrived here, I did not believe in the research; I thought only you would benefit, and we, the community, would continue in the same situation. For that reason I did not want to get involved in the research. Now, I realize the importance of this type of research and thank you for what you have done for us, for recognizing our knowledge about our environment and for your concern in passing this information on to the children*”.

Suggestions on new return activities were also registered, such as that proposed by a local farmer: “*You have taught us to value knowledge of local plants; now we need to learn how to preserve certain plant species that are endangered...*”.

The day after the event, the research and extension teams visited the homes of all the community members who were not able to attend the event to give them copies of the

catalog, explaining its content and usefulness (Fig. 5D). This was an important step towards the end of the project to make sure that everybody received their copies, i.e., received the “return” of the information given to the investigators.

The creation and publication of this catalog reinforced the importance of the partnership established between researchers and local populations, who were recognized for their time spent in the research and for their sharing of knowledge (Patzlaff *et al.* 2009).

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REFERENCES

- Albagli S (2006) Convenção sobre diversidade biológica: uma visão a partir do Brasil. In: Garay I, Becker BK (orgs.) *Dimensões Humanas da Biodiversidade: O Desafio de Novas Relações Sociedade-Natureza no Século XXI*, Editora Vozes, Rio de Janeiro, pp 113-134
- Albuquerque UP, Andrade LHC (2002) Uso de recursos vegetais da caatinga: o caso do agreste do estado de Pernambuco (Nordeste do Brasil). *Interciencia* 27, 336-346
- Albuquerque UP, Nascimento LGS, Vieira FJ, Almeida CMAD, Ramos MA, Silva ACO (2010a) “Return” and extension actions after ethnobotanical research: The perceptions and expectations of a rural community in semi-arid northeastern Brazil. *Journal of Agricultural Environmental Ethics* in press
- Albuquerque UP, Lucena RFP, Alencar NL (2010b) Métodos e técnicas para coleta de dados etnobiológicos. In: Albuquerque UP, Lucena RFP, Cunha

- LVFC (Eds) *Métodos e Técnicas na Pesquisa Etnobiológica* (v.1, Estudos & Avanços), NUPEEA, Recife, pp 483-497
- Albuquerque UP, Araújo TAS, Soldati GT** (2010c) O "retorno" das pesquisas etnobiológicas para as comunidades. In: Albuquerque UP, Lucena RFP, Cunha LVFC (Eds) *Métodos e Técnicas na Pesquisa Etnobiológica* (Vol 1, Estudos & Avanços), NUPEEA, Recife, pp 483-497
- Alencar NL** (2008) O papel das plantas exóticas em farmacopéias tradicionais. MSc thesis, Universidade Federal de Pernambuco, 61 pp
- Araújo EL, Castro CC, Albuquerque UP** (2007) Dynamics of Brazilian Caatinga – A review concerning the plants, environment and people. *Functional Ecosystems and Communities* 1, 15-28
- Araújo TAS, Alencar NL, Amorim ELC, Albuquerque UP** (2008) A new approach to study medicinal plants with tannins and flavonoids contents from the local knowledge. *Journal of Ethnopharmacology* 120, 72-80
- Cunningham AB** (1993) *African Medicinal Plants: Setting Priorities at the Interface between Conservation and Primary Healthcare*, People and Plants Working Paper, Paris, n. 1, pp 1-50
- Falcão D, Gilbert J** (2005) Método da lembrança estimulada: uma ferramenta de investigação sobre a aprendizagem em um museu de ciência. *História, Ciências, Saúde – Manguinhos* 12, 93-115
- FIDEM Perfil Municipal** (2008) Municípios da Região Agreste Central. Available online: <http://www.municipios.pe.gov.br>
- Geilfus F** (1997) *80 Herramientas para el Desarrollo Participativo: Diagnóstico, Planificación, Monitoreo, Evaluación* (1st Edn), IICA-GTZ, San Salvador, 208 pp
- IBGE – Instituto Brasileiro de Geografia e Estatística** Censo 2010. Available online: <http://www.ibge.gov.br/censo>
- IBGE – Instituto Brasileiro de Geografia e Estatística**. Perfil dos municípios brasileiros. Available online: <http://www.ibge.gov.br>
- Kageyama PY** (2005) A biodiversidade da mata atlântica: para que e para quem? In: Ming LC, Carvalho I, Vasconcelos MC, Radomski MI, Costa MAG (Eds) *Direitos de Recursos Tradicionais: Formas de Proteção e Repartição de Benefícios*, UNESP, Botucatu, pp 15-20
- Lins-Neto EMF** (2008) Uso tradicionais e manejo incipiente de *Spondias tuberosa* Arruda no semi-árido do Nordeste do Brasil. MSc thesis, Universidade Federal Rural de Pernambuco, Recife, 100 pp
- Oliveira RLC, Lins-Neto EMF, Araújo EL, Albuquerque UP** (2007) Conservation priorities and population structure of woody medicinal plants in an area of Caatinga vegetation (Pernambuco State, NE Brazil). *Environmental Monitoring and Assessment* 132, 189-206
- Patzlaff RG, Peixoto AL** (2009). A pesquisa em etnobotânica e o retorno do conhecimento sistematizado à comunidade: Um assunto complexo. *História, Ciências, Saúde – Manguinhos* 16, 237-246
- Posey D** (1986) Ethnoentomology of the Kaiapó Indians of central Brazil. *Journal of Ethnobiology* 1, 165-174
- Pinto LN** (2008) Plantas medicinais utilizadas por comunidades do município de Igarapé-Miri, Pará: etnofarmácia do município de Igarapé-Mirim - PA. MSc thesis, Universidade Federal do Pará, 98 pp
- Sampaio EVSB** (1995) Overview of the Brazilian Caatinga. In: Bullock S, Mooney HA, Medina E (Eds) *Seasonally Dry Tropical Forest*, Cambridge University Press, New York, pp 35-58
- Sampaio EVSB** (2002) Uso das plantas da Caatinga. In: Sampaio EVSB, Giugetti AM, Virginio J, Gamarra-Rojas CFL (Eds) *Vegetação e Flora da Caatinga*, APNE/CNIP, Associação de Plantas do Nordeste, Recife, pp 49-90
- Santos AD, Gama AMCF, Farias AAC, Souza JA, Chaves MF, Ferreira-Neto PS** (2005) *Metodologias Participativas: Caminhos para o Fortalecimento de Espaços Públicos Socioambientais*, Ed. Peirópolis, São Paulo, 180 pp
- Sieber SS, Medeiros PM, Albuquerque UP** (2010) Local perception of environmental change in a semi-arid area of northeast Brazil: a new approach for the use of participatory methods at the level of family units. *Journal of Agricultural and Environmental Ethics* in press
- Sieber SS, Albuquerque UP** (2010) Métodos participativos na pesquisa etnobiológica. In: Albuquerque UP, Lucena RFP, Cunha LVFC (Eds) *Métodos e Técnicas na Pesquisa Etnobiológica* (Vol 1, Estudos & Avanços), NUPEEA, Recife, pp 85-106
- Siliprandi E** (2002) Desafios para a extensão rural: O "social" na transição agroecológica. *Agroecologia e Desenvolvimento Rural Sustentável* 3, 38-48
- Web-site 1**. Available online: http://www.etnobotanicaaplicada.com.br/pandora_proj1.php