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Medicinal and magic plants from a public market in northeastern Brazil

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Abstract

Markets are public spaces in which many kinds of products are sold, as well as places of cultural information exchange. These spaces are distinctive for each given culture or society as they represent small-scale reproductions of that region's cultural and biological diversity. We carried out ethnobotanical studies in an important traditional market in the city of Recife (Pernambuco, northeastern Brazil) in two distinct years, 1995 and 2002. Our objectives were to compare the taxonomic richness of the plants being sold there in these different years, to investigate differences between the species' relative importance, and to present descriptions of their main uses. Considering the lack of ethnobotanical studies in these markets and the great methodological difficulties in gaining access to this type of information, we discuss the limitations of this kind of study and offer suggestions to deal with specific problems. Semi-structured interviews with the plant vendors were carried out in the market, along with other data-collection and analysis techniques common to ethnobotanical studies. A total of 136 species were recorded – an increase of 58 species between the two study periods – with significant differences among the proportions of families, genera, and species ($p < 0.05$). Despite differences in the relative importance of species found in both surveys, there was an underlying trend maintaining the same species of greatest importance. Our data suggest that markets conserve their basic repertoire while at the same time act as open and dynamic systems that is enriched by adding new plants and their respective use-indications.

Keywords: Ethnobotany; Ethnopharmacology; Herbal markets; Afro-Brazilian cults

1. Introduction

Markets are public spaces in which many kinds of products are sold, as well as places of cultural information exchange. These spaces are distinctive for a given culture or society because they represent small-scale reproductions of that region's cultural and biological diversity. It is common to find specific locations in these markets where plants and animals are sold for medicinal purposes, locations that serve to unite, maintain, and diffuse empirical knowledge from different regions and of different origins. The on-going search for natural products, as part of a collective social strategy, increases the importance of these traditional centers. However, despite this importance, few ethnobotanical studies have focused on herbal vendors in public markets and/or fairs (Jain, 2000). Almeida and Albuquerque (2002) believe that information on exotic and native flora and fauna obtained in these markets can serve as subsides for conservation strategies for commercialized resources. Cunningham (2001) suggested that information concerning commercialized plants could be used for such ends as identifying sites of intensive harvesting, which in turn could be used to monitor plant populations. These markets also supply material to religious groups that use plant and animal resources in a magical-religious perspective (Vogel et al., 1993; Albuquerque, 2006a).

Ethnobotanical studies focusing on traditional markets are still scarce, and methodologies for information collection in these locations are still under development (see some suggestions in Bye and Linares, 1983). Studies carried out until recently have been basically descriptive, focusing on the diversity of

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plants and/or animals commercialized (Nicholson and Arzeni, 1993; Narváez and Stauffer, 1999; Williams et al., 2000; Lev and Amar, 2002; Hanlidou et al., 2004; Macía et al., 2005), although some studies have, in fact, addressed the importance and seasonality of the species sold (Mertz et al., 2001) or have taken advantage of the marketplace context to discuss quantitative analyses in ethnobotanical research (Williams et al., 2005). This same descriptive trend can be found in numerous studies undertaken in Brazil (Costa-Neto, 1999; Parente and Rosa, 2001; Nunes et al., 2003), and contain discussions concerning the origin and conservation of the resources being commercialized (Almeida and Albuquerque, 2002).

Additionally, local markets are linked to the religious practices of millions of Brazilians who practice cults of African origin. In the view of some authors, such as Vogel et al. (1993), these market places constitute obligatory passage for devotees of the Afro-Brazilian cults, localities where it is possible to obtain all the elements necessary to undertake the prescribed rituals, including plants with magic-religious significance. These plants are used in "cleansing baths" designed to eliminate offensive energies from the bodies of the users, and to establish links with the divinities worshiped in these religions; as incense; and in drinks with numerous functions, including closer contacts with the spiritual world (Albuquerque, 2001, 2006a). A number of authors have pointed out the importance and the scope of these plants sold in public markets (Vogel et al., 1993; Parente and Rosa, 2001).

The purpose of the present study was to analyze a list of species sold in one of the oldest and most traditional markets of Recife, Pernambuco State (northeastern Brazil), and compare the data collected at two distinct dates with a 7-year interval between them. This paper also addresses the questions: (1) Was there a change in the taxonomic richness during the 7-year period between the surveys? Here, we are working with the supposition that these markets are open and dynamic systems (e.g. Garro, 1986; Almeida and Albuquerque, 2002) and, as such, will tend to become richer over time with the addition of new elements to their repertoire; (2) Were there differences over time in the proportions of plants used for either medicinal or magical-religious purposes? We believe that in spite of the strong market for plants that satisfy Afro-Brazilian religious cult demands (Vogel et al., 1993), medicinal plants are the dominant commercial element as they are sought by a wider spectrum of society (e.g. Albuquerque, 2006a); (3) Considering the time interval of 7 years, are there differences in the relative importance of the different species? In the same way that we suspect that there will be a taxonomic enrichment of the species offered over time, the influence of modern communication and informal information exchange between people might result in new uses being ascribed to a given plant.

Additionally, we develop here an in-depth discussion of some methodological issues that affect ethnobotanical research in public markets. These considerations are added in an attempt to systematize information found in the literature, as well as to draw attention to new questions and problems that have appeared in practical situations that researchers may encounter.

2. Ethnobotanical research in local markets

2.1. Research questions and hypotheses

Research in local or traditional markets has usually taken a descriptive approach, presenting lists of useful plants (e.g. Nicholson and Arzeni, 1993; Parente and Rosa, 2001). It is rare to find studies that test hypotheses or that propose practical and objective investigative questions (e.g. Hanlidou et al., 2004). Here, we present some examples of questions, based on published works (e.g. Botha et al., 2004; Hanlidou et al., 2004; Macía et al., 2005), which can be used in ethnobotanical studies involving public markets: Where is the source of the plants that are being commercialized? What are the proportions of wild, exotic, and cultivated species found in these markets? Which products (plant parts) are commercialized? What are the implications of this commercialization on the conservation and sustainable use of these plants? What volume of plants is actually sold throughout the year? Is there a seasonal variation in the products and plants commercialized? Which ecosystems furnish the native species sold in these markets? Are different proportions of species commercialized from different ecosystems? Does the number of species offered vary among the interviewees? If variations are seen, what are they due to? How does the medicinal flora offered compare with the medicinal flora known for the region? Are there different levels of knowledge among the interviewees? Is the knowledge system in the market open or closed? Do factors such as sex, occupation, time dedicated to the activity, and education influence knowledge concerning commercialized medicinal plants? What is the herb vendors' perception of the conservationist status of the species commercialized?

Martin (1995) suggested some general lines of enquiry in research regarding traditional markets: (1) information on the vendor; (2) origin of the produce; (3) condition of the goods; (4) management and marketing of the resource; (5) quantity, price and availability; (6) changes in demand and supply.

2.2. Sampling and selection of interviewees

Identifying and contacting interviewees is a crucial step in carrying out research in local or traditional markets. There appears to be a clear separation in Brazil between each informant's background, based on his/her experiences, and the function he/she occupies in the system. Considering Brazil's multicultural character, these spaces became a kind of religious practice center. It is not rare to find products and objects used in initiation rituals or magical-religious practices of Afro-Brazilian cults offered for sale in addition to the medicinal plants. In this sense, the presence of plants for magical-religious purposes may be meaningful depending on the market's local context.

Successful research greatly depends on the appropriate selection of informants. According to our experience, one can usually identify the following social actors: (1) Vendors—people who commercialize the products, but have little detailed information about them. Sometimes they are simply members of a family that traditionally sells medicinal plants who take shifts in the

selling stalls throughout the day. (2) "Herbalists" (*erveiros*) sell the products and also have in-depth knowledge about them. (3) "Root Doctors" (*Doutor de Raizes*) are part of a small pool of experienced people who serve as a local "doctors" and who may or may not actually sell the plants and/or animals used in traditional medicine. The name given to these specialists may vary regionally in Brazil: *doutor de raizes* ("root doctors"), *raizeiros*, *erveiro*, or *ervateiro*, but they are known as specialists in collecting and selling medicinal plants in local markets (Araújo, 2004). Although these "popular specialists" are generally illiterate (Araújo, 2004), education levels may actually vary considerably.

In addition to selling medicinal plants, these potential informants may also gather them, although this seems to be less common in markets in larger urban centers. The vendors in major cities normally receive the plants from a professional collector, although this person may only collect plants in an opportunistic manner and offer them periodically at the markets. It is not hard to find several herb-sellers in the same market who depend on the same collector. The *raizeiros* described by anthropological researchers in the second half of the 20th century in Brazil can still be found in several places in northeastern Brazil, although some of their traditional characteristics have disappeared.

> "In the several fairs we visited, the raizeiro's booth always has the same style: a piripiri mat, laid out on the ground, on top of which small piles of roots, bark, seeds, vines, bird feathers, armadillo and turtle carapaces, deer nails, capybara nails and teeth, horns, snake skins, cans filled with powders of certain woods or seeds, fat, and inevitably, an enormous ox horn full of the indispensable rapé (snuff)" (Araújo, 2004).

All of these elements must be taken into consideration when selecting informants, especially because one will often encounter people just starting out in this line of activity. For example, Almeida and Albuquerque (2002) noticed that some informants in a popular market in the interior of the state of Pernambuco stood out for the quality of information they provided and the amount of time they had dedicated to this activity. Usually, these markets are open knowledge systems (see Garro (1986) for a definition of open and closed knowledge systems), and information is exchanged frequently between the vendors, especially novice vendors. As such, it is common to encounter significant consensus as to the plants to use to treat certain health problems (see Almeida and Albuquerque, 2002). Product exchange is also common, as vendors will often consult one another when a client does not find a desired product in a given booth. The reputation of these specialists varies according to the seller's honesty and understanding of the market's medical and magical-religious sphere. For example, those who follow Afro-Brazilian cults tend to seek out people with an extensive personal knowledge of the religion (or a diversified assortment of products) when seeking materials needed to carry out their rituals. Dishonesty implies offering plants different from the ones the client actually seeks.

Initial contact with this cultural universe is a delicate affair, as several factors can influence these people's receptivity to interviews: (1) fear that the interviewers may represent some regulatory institution (some products may be derived from animal threatened with extinction, for example) or future competitors eager to learn quickly and easily; (2) the number of prospective clients at the booths. There are specific market days with significantly greater numbers of customers. Visits on these days are not recommended, as there will certainly be competition for the vendor's attention and the researcher will almost always be disregarded; (3) it is not unusual that an informant may not agree to talk to researchers for personal reasons (sometimes related to previous appearances on television or in the newspaper).

Our experience has shown that the best way to start an interview is by fully explaining the study in detail. Sometimes people will initially refuse (due to mistrust or fear), but later agree to participate after seeing that their colleagues have cooperated without any problems. Receptiveness in public markets is generally far less than that encountered in small rural communities. Fear and mistrust are much more intense in larger cities and can be frustrating to the researcher who sees his time passing without getting people involved in his project. A regular presence at the market, informal conversations, and buying products for personal use often helps to eliminate these barriers. The researcher needs to pay close attention to these considerations, because the quality of the information received will greatly depend on eliminating any sources of bias—an interviewee may often respond quickly and without commitment just to get rid of the researcher. Respect and patience are necessary ingredients in any ethnobotanical study, and the researcher will need even larger doses of those virtues in order to carry out research in these markets. Some researchers adopt the strategy of buying plants to cooperate economically and to gain the vendor's trust (Macía et al., 2005).

The sources of these specialists' knowledge about plants may be diverse, and it is common to note in their conversations that certain information about the plants was passed from field aids (*mateiros*) or collectors. In these cases, the collectors can be considered the "generators" or primary sources of the phytotherapeutic empirical knowledge. Additionally, it is not rare to find herb vendors who consult books on medicinal plants, and will often refer to them to remember plant names, indications, or manners of use. Young people have generally lost interest in the knowledge of their elders due to the influence of modern media; another world of information is being presented which destroys the structure for transmission of traditional knowledge (see alternative explanations in Voeks and Leony, 2004; Albuquerque, 2006b). Formal education also significantly decreases the time youngsters spend with their elders, promoting even greater indifference towards traditional knowledge (Amorozo, 1996).

Thus, one of the great problems of collecting data in public markets is related to obtaining a sufficient sampling of informants who will agree to participate in the study. Information gathering in this type of study requires a good deal of time and patience on the part of the interviewees, and the interviewer must rely on his/her common sense. As interviewees may agree to participate only with time restrictions, or even be unwillingly and omit relevant information, caution, good criteria, and patience must be used in selecting the group to be interviewed.

2.3. Data collection

Research in public markets commonly employs semi-structured interviews mediated by questionnaires (Almeida and Albuquerque, 2002; Botha et al., 2004; Macía et al., 2005). Our experience has shown that the interviewees often become nervous when confronted with researchers asking one question after the other from a questionnaire. There have been situations in which the interviewee loses his/her patience or concentration while waiting for the researcher to take notes or to ask the next question. Depending on the study's objectives, and because interviewing is a highly reactive method, problems may sometimes arise related to the information's accuracy. The way the questions are asked is particularly sensitive in these cases. If we ask "Which plants do you know or indicate for medicinal use?" the interviewee may talk of his/her individual repertoire, which might not always include plants being sold. As such, we have found that informal situations contribute to the quality of the information acquired. The free-listing technique may be a very useful tool when associated with direct observation of the products being sold. Data collection may be complemented by asking for information concerning each of the products encountered. In this way, additional data on price, availability, and seasonality can be collected directly. However, choosing any given methodology will depend on the study's goals. Successive visits and encounters with informants are – in our opinion – indispensable for collecting accurate information (Hanlidou et al., 2004; Macía et al., 2005), as well as specimens for taxonomical identification (Nicholson and Arzeni, 1993).

2.4. Voucher specimens

One of the greatest problems for studies carried out in public markets is collecting fertile material for identification and later storage in local herbaria. According to Nguyen (2005) "(...) many market studies lack in scientific rigor by not making voucher collection of the plants listed or described. There is an even greater bias against the collection of 'common cultivated plants'. In such studies, it appears that common cultivated plants are just that, common, their identification known, and therefore, not worthy of a voucher collection". Albuquerque (1999), for example, described a new variety of *Ocimum minimum* L. (a common cultivated medicinal and aromatic plant) found in a local market in Pernambuco (northeastern Brazil). All ethnobotanical studies and specialized periodicals point out the necessity of citing the collection or herbarium number of each plant mentioned. However, collecting usable herbarium samples is not always possible, in Brazilian traditional markets where many plants are commercialized in a dry, pulverized, or fragmented form. On other occasions only the seeds, roots, leaves, or barks may be available. When the vendor is also the collector, it is often possible to ask for their help in collecting botanical material (Parente and Rosa, 2001; Mertz et al., 2001). This may not always be possible, however, because some vendors do not collect the plants they sell, and some are not available for fieldwork. The biggest problem is not really identification, but rather obtaining material to deposit in a herbarium. As such, the problem must be approach on two fronts: problems related to identification, and problems relating to collecting specimens for herbarium storage.

Medicinal plants can be collected in the field from samples obtained directly from the vendors (either bought or collected with the vendors' help) and subsequently identified in the laboratory through the use of specialized literature, with the help of specialists, and/or by comparison with existing herbarium specimens (e.g. Nicholson and Arzeni, 1993). In the case of plants commercialized in fragments or in parts, if it is absolutely impossible to collect entire and fertile samples for identification, there are no other options open except to search for "taxonomical clues" based on the locally available scientific information, or to attempt to identify the samples through pharmacobotanical procedures. For example, in our laboratory we have detailed morphological and anatomical descriptions of some of the region's common medicinal plants that can be used as standards to identify other samples.

Our experience has showed that purchasing samples from vendors for inclusion in herbariums (see Macía et al., 2005) is not always a reliable option, as there is no way to guarantee the accuracy of the information provided, especially in terms of the locality where the plant was collected. As such, researchers should make the greatest possible effort to collect botanical samples themselves. When this is not possible, however, an alternative path would be to identify the samples and then compare them with herbarium collections. In these cases the purchased sample would become the "reference voucher". Another alternative would be to prepare an "itinerant herbarium" with identified specimens that could be shown to the informants and/or compared to the plant being sold. However, we have found that informants often cannot recognize the whole, fertile plant when they are accustomed to dealing with only the bark, seeds, or roots. It is important not to put faith in common names. We have found, for example, that in the public markets of Pernambuco, the bark of *aroeira* may come from either of two distinct species: *Myracrodruon urundeuva* or *Schinus terebinthifolius*. The first is distributed in the state's semi-arid region, while the second is cultivated or occurs naturally in areas nearer to the coast.

3. Methodology

3.1. Study area

According to the city records of Recife, Pernambuco State, NE Brazil (Fig. 1, 8°04′03″S and 34°55′0″W) (Csurb, 2006), there are a total of 17 public markets and fairs in that metropolis. Open-air fairs are held in public areas during specific days of every week, and they are normally found near public markets. These markets sell horticultural products and handicrafts, and usually have a medicinal plant section consisting of several stands. The São José Market in Recife was selected for this study. It is the oldest market in the region, and was built of wrought iron and modeled after the public market in Grenelle, Paris. The building was inaugurated on 7 September 1875, and is a registered as an historical heritage monument and occupies an area of 3541 m^2 with two pavilions with 377 stands. Many different

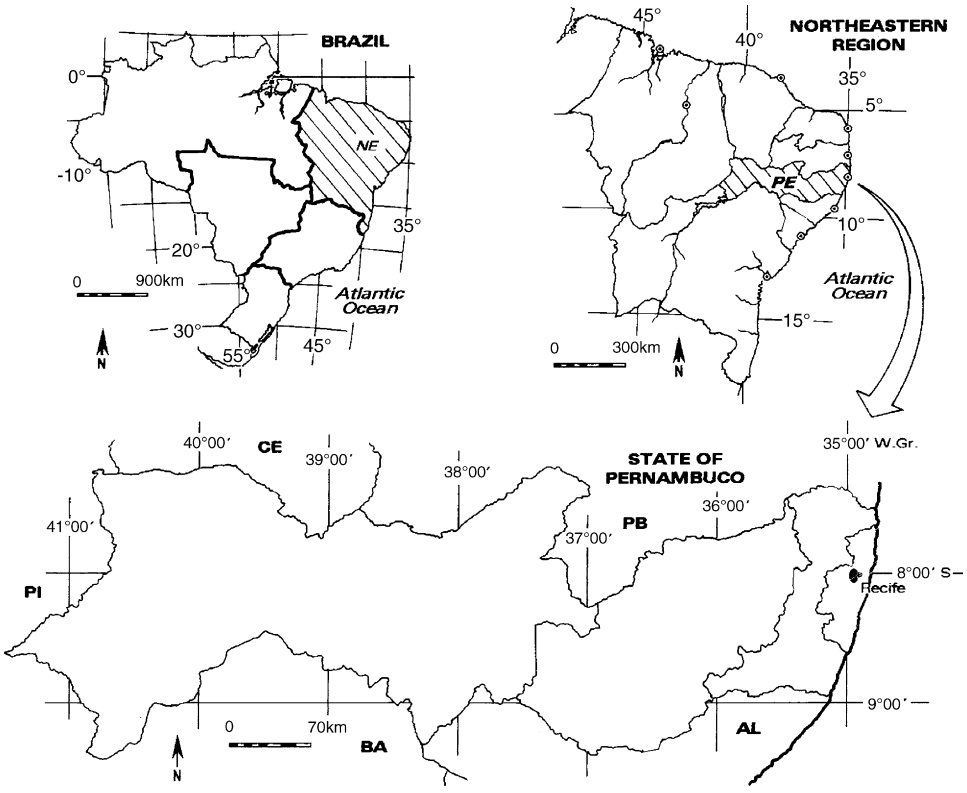

Fig. 1. Study area in the city of Recife, State of Pernambuco, Brazil.

products such as food items, medicinal and religious plants, and fish (about 1.3 tonnes of fish and 400 kg of other sea foods each week) are sold there (Csurb, 2006). During its 131 years of functioning, the Mercado de São José has been a cultural center for the city, offering shows by regional singers, dancers, and local poets (Fundaj, 2006).

3.2. Data-collection procedures

Fieldwork was carried out in two phases. The first phase (1993–1995) involved visits to the market that identified 22 stands/booths selling medicinal plants and interviews with 10 vendors. The second phase was carried out between 2001 and 2002, and eight people were interviewed. There are currently 11 booths inside the market that specialize in medicinal plants, and each interviewee worked in one of the booths or stands, and freely agreed to participate in the study. The selection of interviewees was based solely on their willingness to participate in the survey, while some vendors refused to cooperate as they felt that it would interfere with their sales. As such, approximately 40–50% of the total number of vendors participated in the survey. The informants' ages (in both surveys) varied from 25 to 60. We made no distinctions among the interviewees, as the study was aimed at recording the repertoire of plants commercialized at the time of survey.

The study consisted of exploratory research mediated by semi-structured interviews (Albuquerque and Lucena, 2004a,b) and was designed to obtain information concerning the species available at the markets, the plant parts commercialized, and the medicinal indication(s) attributed to them. The data-collection phase also involved recording traditional formulas and recipes, which were described by the vendors themselves or obtained from the product packages. In addition to the interviews, other information was collected about the products offered for sale by pointing out plants in the stall and asking for their names and therapeutic indications. Plants with magical-religious indications were identified either by the informants during the interviews, or through consulting ethnobotanical literature concerning the use of plants in Afro-Brazilian rituals in Recife-Pernambuco (Albuquerque and Chiappeta, 1994, 1995; Albuquerque and Andrade, 1998; Albuquerque, 2001, 2006a).

Plant identification was confirmed by collecting samples and comparing them with material deposited in the UFP (Botany Department, Federal University of Pernambuco) and PEUFR herbaria (Biology Department, Federal Rural University of Pernambuco). Plant organ (stems, roots, etc.) samples that were fragmented or pulverized, or were identified using standards available at the Laboratory of Applied Ethnobotany and/or by consulting specialized literature on plant drug analysis (Farmacopéia Brasileira, 1959; Oliveira et al., 1998; Farmacopéia Brasileira, 2000). Approximately, 16.91% of the plants were identified using this latter process. Voucher material of species that were collected in others areas with aid of informants were deposited in the UFP herbarium.

3.3. Data analysis

Each plant's relative importance (RI), based on Bennett and Prance (2000), was calculated during analysis of the data. This technique emphasizes a plant's importance in relation to its

versatility—the number of use-indications assigned to it. RI was calculated according to the formula: RI = NCS + NP, where NCS is the relative number of corporal systems; calculated by dividing the number of corporal systems treated by a given species (NCSS) by the total number of corporal systems treated by the most versatile species (NCSV). NP is the relative number of properties; calculated by dividing the number of properties attributed to a given species (NPS) by the number of properties attributed to the most versatile species (NCSV). A discussion of the limitations of this technique was presented in Albuquerque et al. (2006). All of the medical attributions cited by the interviewees were grouped into 17 corporal system categories, based on Almeida and Albuquerque (2002): (1) infectious and parasite-related diseases; (2) neoplasms; (3) diseases related to the endocrine glands, nutrition, or metabolism; (4) diseases of the blood and hematopoietic organs; (5) problems of the sensorial system (ears); (6) problems of the sensorial system (eyes); (7) problems of the nervous system; (8) problems of the respiratory system; (9) problems of the circulatory system; (10) problems of the digestive system; (11) problems of the genitourinary system; (12) diseases of the skin and subcutaneous cellular tissues; (13) diseases of the skeletal, muscle, or connective tissues; (14) undefined pains or illnesses; (15) lack of sexual desire; (16) physical and mental debility; (17) general inflammations.

The differences in taxonomic richness between the years were compared using the Williams' *G* test (Sokal and Rholf, 1995). The relationship between the relative importance of the species that were encountered in both surveys was tested using Spearman's coefficient (Sokal and Rholf, 1995), and the difference in relative importance between these two groups of plants was compared using the Kruskal–Wallis test (Sokal and Rholf, 1995). The Sorensen coefficient was used to compare the similarity between the two surveys (Araújo and Ferraz, 2004).

4. Results and discussion

4.1. Variation in taxonomic richness

The two surveys at the São José Market yielded a total richness of 136 species, 120 genera, and 66 families; 29 specimens were not identified. Similar values for richness have been documented by other authors. Hanlidou et al. (2004) reported 146 plant species used in traditional medical practices that were sold at public markets in Thessaloniki, Greece. Almeida and Albuquerque (2002) recorded 114 species being sold at an important public market in the interior of Pernambuco State, Brazil. Nicholson and Arzeni (1993) surveyed 135 plants, and identified 70 species and 65 genera sold in markets in Monterrey, Mexico, and a total of 129 useful plants were reported from La Paz and El Alto, Bolivia (Macía et al., 2005). A study carried out in 50 markets and medicinal plant stores in Witwatersrand, South Africa, yielded a total of 511 species distributed among 328 genera (Williams et al., 2000).

The plant stocks in the São José Market in Recife are composed basically of medicinal plants (97), with 8 species with exclusive magical-religious attributions and 31 species used for both purposes. Statistically significant variation in species richness was found during the 7-year interval between the two surveys. In 1997, 48 species, 45 genera, and 30 families were recorded, while in 2002, a total of 119 species, 104 genera, and 52 families were recorded ($G = 21.37$; $p < 0.0001$). Likewise, the similarity between the two surveys was very low ($S = 0.30$). There was an increase of 57 species during the 7-year interval, which might reflect a real enrichment in the repertoire of useful plant. Eighty-eight species were unique to the 2002 survey, while only 17 species were recorded exclusively in 1995, while 31 were found in both surveys (Fig. 2).

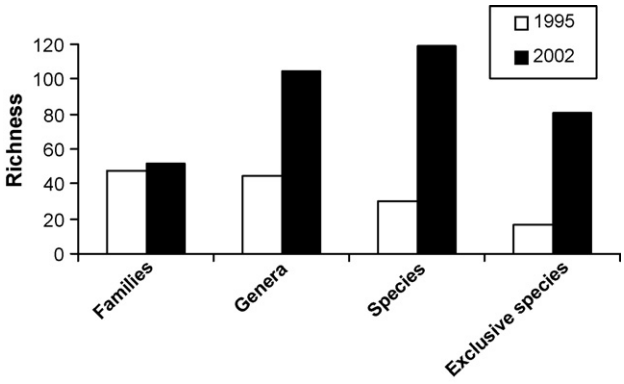

Fig. 2. Richness of plants commercialized at the São José Market (Pernambuco, northeast Brazil) in two surveys in different years.

Of the 17 species found exclusively in 1995, 8 were considered medicinal: *Justicia gendarussa* Burm., *Pfaffia glomerata* (Spreng.) Peders, *Conyza bonariensis* (L.) Cronq., *Begonia huberi* DC., *Cleome spinosa* L., *Bryophillum calicinum* Salisb., *Lavandula spica* L., and *Turnera ulmifolia* L. The therapeutic use of the latter species had been forgotten by all the informants, suggesting that this species was already very little used even at that time. *Lavandula spica* L., a cultivated plant known as "alfazema", may have been substituted by another species from the genus *Hyptis* that was encountered in the 2002 survey. The absence of these species from the 2002 survey may be explained by: low demand; seasonality of the supply (which may have affected the 2002 survey); or their substitution by other species (which seems to have been the case for *Lavandula spica* L. and *Begonia huberi* DC). The other species only encountered in 1995 (used basically for magical-religious purposes) may have been overlooked in the 2002 survey due to the lack of informants with this specialized knowledge in that sampling year.

The stem and bark of native woody species of the Brazilian *caatinga* and *cerrado* vegetation that are used for medicinal purposes were frequently encountered in the stands that were surveyed. "Aroeira" (*Myracrodruon urundeuva* Fr. All.), "barbatimão" (*Stryphnodendron adstringens* (Mart.) Coville.), "caju roxo" (*Anacardium occidentale* L.), and "quixaba" (*Sideroxylon obtusifolium* (Roem. & Schult.) T.D. Penn.) were mentioned by 100% of the interviewees in both surveys. Even though bark is the most common plant part encountered in these markets, a larger variety of leaf material is also sold. Researchers such as Costa-Neto and Oliveira (2000), Parente and Rosa (2001), Moreira et al. (2002), and Sá (2002) have stressed the impor-

tance of the use of leaves in popular medicine. On the other hand, in studies carried out in Caruaru, Pernambuco State, by Almeida and Albuquerque (2002), and in two smaller towns in the *sertão* region of Paraíba State by Marinho (2004), more use of bark than of leaves was reported. This data suggests that the plant parts most used may depend on the region in question.

4.2. Plants and their therapeutic applications

In the analysis of the relative importance (RI), in 2002, of the species examined, 23 plants were found to be highly versatile in terms of their uses. These plants had a RI greater than 1 (Table 1), and were cited for up to nine categories of corporal systems. On the other hand, about 50 species had a low relative importance (RI = 0.20), including "cabacinha" (*Luffa operculata* Cong.), bush basil (*Ocimum minimum* L.), and the leaves of passion fruit (*Passiflora edulis* Sims) and avocado (*Persea americana* Mill.). The species with the highest relative importance in both surveys were: *Myracrodruon urundeuva* (Engl.) Fr. All. (2.0 and 1.91, in 1995 and 2002, respectively), *Aeollanthus suaveolens* Mart. ex Spreng. (1.33 and 1.21, respectively), *Sambucus nigra* L. (1.67 and 0.99, respectively). The species with the highest relative importance in only one survey included *Symphytum officinale* L. (1.78, only in 2002), *Aloe vera* L. (1.82 in 2002), *Schinus terebinthifolius* Radd. (2.0, only in 1995), *Psichotria ipecacuanha* (Brot.) Stokes (1.51, only in 2002) (Table 1). There was no correlation between the RI values obtained by a given species in the two different surveys ($rs = 0.16$; $p > 0.05$), but there were significant differences in relation to the mean obtained by all of the species together ($H = 7.14$; $p < 0.05$). In 1995, the average RI was 0.95 (standard error = 0.38), while in 2002 the average RI was 0.68 (standard error = 0.40). This difference in the average RI reflects fact that these calculations consider the groups of indications that a given species receives during a given period of time; as such, this analysis serves only to demonstrate that these indications vary over time. For example, in the 1995 survey only three indications were cited for *Myracrodruon urundeuva*, while an additional 18 were noted in 2002. This was the most important species in both surveys, but of the 10 most important plants in both years, only 3 were common to the both surveys: *Myracrodruon urundeuva*, *Sambucus nigra* L., and *Justicia pectoralis* Jacq.

The analysis of therapeutic indications revealed that 205 different use-indications were cited to treat the infirmities of several corporal systems (Table 2). Most of these treatments were indicated by the vendors themselves, who take on the role of a "doctor" in indicating the plants to be used as well as the instructions for their preparation.

The corporal system category with the greatest number of species cited was undefined pains and illnesses (63 species), followed by problems of the digestive (60), respiratory (42), genitourinary (44), and circulatory systems (38) (Table 2). The most cited treatment indications are for problems related to the respiratory system (such as coughing and colds), followed by back problems. The plant with the greatest number of indications was "jatobá" (*Hymenaea* sp.), with 35 distinct indications, (including indications of manipulated products) including treating coughs, prostate problems, the lungs, asthma, and the common cold. According to Lorenzi and Matos (2002), the bark of this species is commonly used by tribes in Peru for treating diarrhea. Studies carried out on extracts of the leaves and the bark of this plant have identified antimicrobial activity. The plant with the second highest number of indications was "aroeira" (*Myracrodruon urundeuva*), with a total of 33 uses, (including indications of manipulated products) including action against acne, tumors, arthritis, inflammations, itching, and rheumatic fever. Pharmacological studies have demonstrated anti-inflammatory and wound-healing activity in extracts of this species (Queiroz et al., 2002).

4.3. Toxicity of medicinal plants sold in traditional markets

Many plants cited as medicinal have proven toxicity. This is a common observation in ethnobotanical surveys, even though people tend to think of plants as healthy, beneficial, and free of threats. The popular "pinhão-branco" and "pinhão-roxo" (genus *Jatropha*) cited in this study have a caustic latex that can irritate the skin and mucous membranes. The seeds of these plants also contain a lipoid resin complex that can cause dermatitis (Parente and Rosa, 2001).

The genus *Solanum*, which is also commonly found in public markets, comprises several species that contain the alkaloid solanin. This compound is not absorbed naturally by the human body, but induces (through hydrolysis) the absorption of another toxic substance causing dazing and stupor (Parente and Rosa, 2001). The popular "cabacinha" (*Luffa operculata*) was sold in all of the places surveyed as a treatment for sinusitis without any restrictions. This plant is known to be potentially highly toxic, and can cause nausea, abortions through cytotoxic action, bleeding and irritation of the mucous membranes, and demonstrates embryotoxic protein synthesis-inhibiting action among other effects (Ngai et al., 1993; Lorenzi and Matos, 2002). The vendors themselves mentioned cases of death through exaggerated ingestion of this plant. "Comfrey" (*Symphytum officinale* L.) was found with four herbalists, who indicated the ingestion of a tea made from this plant for liver problems, gastritis, ulcers, etc. This species has additional proven medicinal effects, including wound-healing, anti-irritant activity, and moisturizing effects due to the presence of allantoin and mucilage (Ritter et al., 2002) although studies have proven that when used internally for long periods of time, this plant can cause veno-occlusive diseases, especially of the liver, provoking late hepatic cirrhosis and cancer due to the cumulative effect of pyrrolizidinic alkaloids (Saito and Oliveira, 1986; Ferro, 1989; Parente and Rosa, 2001). "Arruda" (*Ruta graveolens* L.) was cited in this study as a treatment for earaches, strokes, and late menstruation, yet it contains metilnonilcetone, which can provoke abortions. Extracts of this same plant reduced fertility in rats (Mengue et al., 2001; Ritter et al., 2002). Finally, "mastruz" (*Chenopodium ambrosioides* L.), which is indicated for respiratory problems and parasite-related diseases, has been shown to be highly toxic to the central nervous system. Several cases of severe intoxication, and even death, have been reported due to the use of this plant (Mengue et al., 2001).

Table 1
List of the plants commercialized at the São José Market, Recife, State of Pernambuco, northeast Brazil

Family scientific name	Popular name	RI value 1995	RI value 2002	Part used	Indications
Acanthaceae					
Justicia sp.	Anador	–	0.29	Leaf	Pains, fever
Justicia gendarussa Burm.	Erva-santa	1.0	–	Leaf	Pains, fever, magical-religious
Justicia pectoralis Jacq.	Chambá	1.0	0.77	Leaf	Coughing, colds, pneumonia, asthma, pains, fever
Alismataceae					
Echinodorus sp.	Chapéu de couro		0.61	Leaf	Kidneys, spine, inflammation
Amaranthaceae					
Gomphrena sp.	Perpetua branca		0.20	Leaf, flower	Heart
Pfaffia glomerada (Spreng.) Peders.	Acônito	0.67	–		Fever
Anacardiaceae					
Anacardium occidentale L.	Caju Roxo	0.67	1.21	Stem (inner bark)	Diabetes, coughing, hepatitis, inflammations, leucorrhea, wound-healing, magical-religious
Myracrodruon urundeuva Fr. All.	Aroeira	2.0	1.91	Stem (inner bark)	Acne, tumors, rheumatism, skin problems in general, allergy, cracks on the feet, arthritis, insect bites, bacteria, mycosis, itching, hemorrhage, germs, abdomen colic, fungus, pain in the digestive organs, rheumatic fever, feet fungus, wound-healing, inflammation, women's pains, magical-religious
Schinus terebinthifolius Radd.	Aroeira	2.0	–	–	Wound-healing, inflammation, women's pains, magical-religious
Annonaceae					
Annona sp.	Araticum Cagão	–	0.40	Bark, root, leaves	Pains, nerves
Annona salzmannii A. DC	Condessa	–	0.20	Leaf	Diabetes
Apiaceae					
Coriandrum sativum L.	Coriander	–	0.20	Seed	Blood circulation
Foeniculum vulgare Gaertn.	Endro	–	0.61	Seed	Bursitis, pains in general, liver
Pimpinella anisum L.	Erva Doce	–	0.59	Fruit, leaf	Indigestion, tranquilizer, liver, magical-religious
Aquifoliaceae					
Ilex paraguariensis A. St. Hilaire	Matte	–	0.70	Leaf	Nerves, fatigue, digestive
Arecaceae					
Syagrus sp.	Coco catolé	–	0.20	Leaf	Spine
Asteraceae					
Acanthospermum hispidum DC	Espinho de cigano	1.0	0.40	Whole plant	Asthma, tiredness, bronchitis, coughing, magical-religious
Artemisia vulgaris L.	Losna	1.33	0.20	Leaf, bark	Abortion, common cold, inflammation, women's pains
Baccharis trimera (Less) DC	Carqueja	–	1.39	Leaf	To lose weight, high blood pressure, diabetes, bad circulation, urinary inflammation, anemia, menopause
Conyza bonariensis (L.) Cronq.	Rabo de raposa	–	–	–	No indication
Egletes viscosa Lees.	Macela	–	0.59	Seed, bark	Gall bladder, stomach, abortion, tranquilizer, intestine
Helianthus annuus L.	Sunflower	–	0.49	Seed	Stroke, blood circulation, cholesterol, magical-religious
Matricaria chamomilla L.	Chamomile	–	0.40	Flower	Tranquilizer, liver, intestine, high blood pressure
Melampodium divaricatum DC	Botão de Ouro	–	0.20	Flower	Nervousness, magical-religious
Tagetes patula L.	Cravo de defunto	–	–	Flower	Magical-religious
Vernonia condensata Baker	Alcachofra	–	0.40	Leaf	To lose weight, stomach, liver
Wedelia trilobata (L.) Hitch	Bem-me-quer	–	–	Flower	Magical-religious

Table 1 (*Continued*)

Family scientific name	Popular name	RI value 1995	RI value 2002	Part used	Indications
Begoniaceae					
Begonia huberi DC	Caapeba	0.67	–	Leaf	Liver
Bignoniaceae					
Anemopaegma sp.	Catuaba	–	1.19	Stem	Impotency, nerves, gases, tonic, physical and mental exhaustion
Tabebuia avellanedae Lor. et Gris	Pau D'arco	1.33	0.70	Bark	Impotency, stomatitis, throat ulcers, intestinal inflammations, backache, inflammations
Boraginaceae					
Cordia sp.	Moleque duro	–	0.20	Stem	Dysentery
Heliotropium indicum L.	Fedegoso	–	0.61	Root, leaf	Leg pain, stroke, blemishes
Symphytum officinale L.	Comfrey	–	1.78	Leaf	Asthma, ulcer, prostate, diabetes, leukemia, hepatitis, liver, gastritis, inflammations in general
Brassicaceae					
Brassica integrifolia Schulz	Mustard	–	0.29	Seed	Blood circulation, stroke
Burseraceae					
Bursera leptophleos Mart.	Emburana	–	0.20	Seed	Sinusitis
Cactaceae					
Cereus jamacaru DC	Mandacaru	–	0.20	Stem	Kidneys
Caesalpiniaceae					
Bauhinia sp.	Pata de vaca	–	0.70	Leaf	Diabetes, cholesterol, kidneys, high blood pressure
Caesalpinia echinata L.	Brazil wood	–	0.40	Stem	Diabetes, stomach, abortion
Caesalpinia ferrea Mart.	Jucá	–	1.01	Fruit, leaf	Anti-inflammatory, diabetes, fall, pains, lung infections
Hymenaea sp	Jatobá	–	0.88	Stem	Coughing, prostate, asthma, common cold, lungs
Senna alata (L.) Roxb.	Café Beirão	–	0.20	Leaf	Stroke, anemia
Senna occidentalis (L.) Link	Manjerioba	0.67	0.81	Leaf	Anemia, stroke, to lose weight, late periods
Capparaceae					
Cleome spinosa L.	Mussambê	0.67	–	Flower	Coughing
Caprifoliaceae					
Sambucus nigra L.	Sabugueiro	1.67	0.99	Flower	Coughing, common cold, measles, chicken pox, tiredness, fever
Caryophyllaceae					
Dianthus caryophyllus L.	Cravo branco	–	–	Flower	Magical-religious
Celastraceae					
Maytenus rigida Mart.	Bom nome	–	0.49	Bark	Kidney infection, lungs, common cold, body pains
Maytenus sp.	Espinheira santa	–	1.06	Leaf	Diabetes, ulcer, kidneys, diarrhea, bad digestion, gastritis, intestines
Chenopodiaceae					
Chenopodium ambrosioides L.	Mastruz	0.67	0.68	Leaf	Worms, influenza, tuberculosis, bronchitis
Chrysobalanaceae					
Licania sp.	Oitissica	–	0.20	Leaf	Diabetes
Clusiaceae					
Vismia guianensis (Aubl.) Choisy	Lacre	0.67	0.49	Leaf	Spine, pains in general, kidneys, magical-religious
Convolvulaceae					
Ipomoea asarifolia Roem & Schult.	Salsa da praia	0.67	0.20	Leaf	Swelling, inflammation
Operculina sp.	Batata de purga	–	0.20	Root	Blood, abortion

Costaceae					
Costus spicatus Sw.	Cana de macaco	–	0.20	Stem (inner bark)	Kidneys, magical-religious
Crassulaceae					
Bryophyllum calicinum Salisb.	Corona	1.33	–	Leaf	Coughing, pains in general, magical-religious
Kalanchoe brasiliensis Camb.	Corona branca	1.33	0.49	Leaf	Coughing, gastritis, diabetes, pains in general, magical-religious
Cruciferae					
Rorippa pumila (Camb.) A. Lima	Agrião	0.67	0.59	Leaf, root	Stomach, expectorant, gripe, constipation, coughing, tuberculosis
Cucurbitaceae					
Luffa operculata Cong.	Cabaçinha	–	0.20	Fruit	Sinusitis, abortion
Momordica charantia L.	Melão de são caetano	0.67	0.29	Fruit, leaf	Skin itching (scabies)
Wilbrandia sp.	Cabeça de Negro	–	0.20	Root	Blood
Euphobiaceae					
Cnidoscolus urens (L.) Arthur	Urtiga branca	0.67	1.28	Root	Cancer, uterus, prostate, dysentery, ovaries, hemorrhage, inflammation and pains in general, menstruation, kidneys
Croton sp1.	Quebra faca	–	1.08	Leaf	Spine, intestines, cholesterol, diabetes, bad digestion, liver, inflammations in general
Croton sp2.	Quina-quina	–	0.20	Bark	Abortion, common cold
Croton sp3.	Velame Branco	–	0.40	Root	Rheumatism, itching
Jatropha curcas L.	Pinhão branco	–	0.20	Seed	Stroke
Jatropha gossypiifolia L.	Pinhão roxo	–	0.20	Leaf	Hepatitis, magical-religious
Phyllanthus niruri L.	Quebra pedra	0.67	0.29	Leaf, stem	Kidneys, abortion, late periods
Ricinus communis L.	Carrapateira	–	–	Leaf	Magical-religious
Fabaceae					
Amburana cearensis (Fr. All.) A.C. Sm.	Imburana de cheiro	–	1.08	Stem, seed	Coughing, influenza, fever, bronchi, gastritis
Bowdichia virgilioides H.B.K.	Sucupira	–	0.70	Bark	Arthritis, osteoporosis, spine, diabetes, rheumatic pains
Erythrina velutina Willd.	Mulungu	–	0.57	Leaves, stem	Nerves, sinusitis, tranquilizer
Illiciaceae					
Illicium verum Hocker	Anil estrelado	–	0.79	Seed	Stomach, vomiting, colic, rheumatic pains, dizzy spells, magical-religious
Iridaceae					
Crocus sp.	Alçafrão	–	0.20	Leaf	Cancer
Lamiaceae					
Aeollanthus suaveolens Mart. ex Spreng	Macassá	1.33	1.21	Leaf	Asthma, tranquilizer, earache, high blood pressure, constipation, hiccups, coughing, tranquilizer, magical-religious
Hyptis sp.	Alfazema	–	1.37	Leaf	Asthma, dizzy spells, nausea, bronchitis, pains, digestive, tranquilizer, baby colic, constipation, magical-religious
Lavandula spica L.	Alfazema	1.33	–	Leaf	Fever, stomachache, magical-religious
Mentha sp1.	Hortelã Miúdo	–	0.49	Leaf	Worms, common cold
Mentha sp2.	Vega-morta	–	0.20	Leaf	Menstrual cramps
Ocimum americanum L.	Manjerona	0.67	0.20	Leaf	Cholesterol, stomachache, magical-religious
Ocimum basilicum L.	Basil	0.67	0.61	Leaf	Conjunctivitis, earache, stomach, stomachache, magical-religious
Ocimum gratissimum L.	Alfavaca	0.67	0.29	Leaf, whole plant	Dizzy spells, sinusitis, stomachache, magical-religious
Ocimum minimum L.	Basil bush	–	0.20	Leaf	Stomach, magical-religious
Origanum vulgare L	Oregano	–	0.49	Leaf	Nausea, nephralgia, mouth inflammations
Plectranthus amboinicus (Lour.) Spreng.	Hortelã Graúdo	1.33	0.40	Leaf	Common cold, hair loss, coughing, magical-religious

Table 1 (*Continued*)

Family scientific name	Popular name	RI value 1995	RI value 2002	Part used	Indications
Rosmarinus officinalis L.	Rosemary	1.0	1.08	Leaf	Tiredness, coughing, sinusitis, fever, hair loss, influenza, high blood pressure, magical-religious
Salvia sp.	Salvia	–	0.20	Leaf	Diabetes
Lauraceae					
Cinnamomum zeylanicum Blume	Cinnamon	–	0.97	Leaf, bark	Dysentery, stomach, nausea, tranquilizer
Laurus nobilis L.	Bay leaf	–	0.95	Leaf	Amenorrhea, anúria, diarrhea, dyspepsia, gastritis, indigestion
Persea americana Mill.	Avocado tree	–	0.20	Leaf	Kidneys, abortion
Liliaceae					
Aloe vera L.	Babosa	–	1.82	Leaf, stem, root	Cancer, vermifugo, pain in the bones, rheumatism, eczema, hair loss, gastritis, prostate, hemorrhoids, inflammations
Malvaceae					
Gossypium sp.	Cotton	–	0.20	Seed	To thin the blood, magical-religious
Sida cordifolia L.	Malva branca	–	0.59	Leaf	Toothache
Urena lobata L.	Malva rosa	–	0.59	Leaf	Fever, coughing, influenza
Melastomataceae					
Miconia albicans (Sw.) Triana	Carrasco	–	0.49	Stem	Fever, vitiligo, magical-religious
Meliaceae					
Cedrela odorata L.	Cedro	–	0.61	Stem	Swelling, testicle inflammations
Mimosaceae					
*Anadenanthera colubrin*a (Vell.) Brenan.	Angico	–	1.17	Stem (inner bark)	Anemia, coughing, inflammation, asthma, influenza, magical-religious
Mimosa sp.	Jurema	–	0.20	Bark	Gastritis
Stryphnodendron adstringens (Mart.) Coville.	Barbatimão	–	1.30	Stem (inner bark)	Inflammations, bad circulation, wound-healing, cleansing uterine wounds
Monimiaceae					
Peumus boldus Mol.	Boldo	–	0.68	Leaf	Liver, heartburn, constipation
Moraceae					
Cecropia sp.	Imbaúba Branca	–	0.81	Leaf	High blood pressure, tranquilizer, spine, diabetes
Myrtaceae					
Eucalyptus globullus Labill.	Eucalyptus	–	1.35	Leaf	Fever, stroke, measles, chicken pox, asthma, sinusitis, gripe, rhinitis
Psidium guajava L.	Guava	–	0.20	Flower	Liver
Nyctaginaceae					
Boerhavia diffusa L.	Pega Pinto	–	0.29	Root, fruit	Urinary inflammation, venereal diseases
Oxalidaceae					
Averrhoa carambola L.	Starfruit	–	0.20	Leaf	Kidneys
Papaveraceae					
Argemone mexicana L.	Cardo santo	–	0.61	Seed, leaf	Blood circulation, cholesterol
Passifloraceae					
Passiflora edulis Sims	Passion fruit	–	0.20	Leaf	Tranquilizer
Pedaliaceae					
Sesamum orientale L.	White sesame/black sesame	–	0.40	Seed	Blood circulation, stroke
Phytolaccaceae					
Petiveria alliacea L.	Tipim	0.67	0.99	Leaf	Pain in the legs, itching, rheumatism, swelling, magical-religious

Piperaceae					
Piper marginatum Jacq.	Malvaisco/capeba	0.67	1.30	Root, leaf, stem	Blood pressure, asthma, diuretic, stomach, problems in the urinary system, erysipelas
Piper nigrum L.	Black pepper	–	0.20	Seed	Throat
Peperomia pellucida (L.) H. B. K.	Língua de sapo	–	0.40	Whole plant	Blood pressure, high cholesterol, magical-religious
Plantaginaceae					
Plantago major L.	Trançagem	0.67	0.40	Leaf	Throat, stroke
Poaceae					
Bambusa sp.	Bamboo	–	0.20	Root	Erysipelas
Cymbopogon citratus (DC) Stapf	Capim santo	–	0.70	Leaf, whole plant	Blood pressure, blood circulation, headache, tranquilizer
Imperata brasiliensis Trin.	Sapé	–	0.20	Root	Spine
Punicaceae					
Punica granatum L.	Persimmon	1.33	0.40	Fruit	Anemia, gastritis, throat, indigestion
Rhamnaceae					
Ziziphus sp.	Juá	–	0.68	Bark	Blood pressure, teeth, hair loss, fever
Rosaceae					
Chrysobalanus icaco L.	Guagiru	–	0.29	Bark, root	Diabetes, cholesterol
Rubiaceae					
Borreria verticillata (L.) G.F.W. Meyer	Vassoura de Botão	0.67	0.70	Leaf, root	Vaginal discharge, impotency, hemorrhoids, magical-religious
Coffea arabica L.	Coffee	–	0.29	Leaf	Abortion, bad circulation, swelling
Psychotria ipecacuanha (Brot.) Stokes.	Pepaconha	–	1.51	Whole plant	Dysentery, worms, blood, whooping-cough, cancer, children's teething, bronchitis
Rutaceae					
Citrus aurantium L.	Orange tree	–	0.29	Leaf	Tranquilizer
Ruta graveolens L.	Arruda	0.67	0.81	Leaf	Earache, stroke, late periods, lice
Sapindaceae					
Paullinia cupana Kunth	Guaraná	–	0.40	Seed	Tonic, stimulant
Sapotaceae					
Sideroxylon obtusifolium (Roem. & Schult.) T. D. Penn.	Quixaba	–	1.19	Stem, leaf	General inflammations, injuries, blows, wound-healing, cleansing uterine wounds
Schizaeaceae					
Lygodium venustum Sw.	Abre-caminho	–	–	Whole plant	Magical-religious
Lygodium volubile Sw.	Abre-caminho	–	–	Whole plant	Magical-religious
Scrophulariaceae					
Scoparia dulcis L.	Vassourinha de benzer	–	–	Whole plant	Magical-religious
Solanaceae					
Solanum americanum L.	Erva Moura	–	0.20	Leaf	Inflammation
Solanum paniculatum L.	Jurubeba	–	1.10	Fruit, root, Seed, leaf	Anemia, spleen inflammation, liver, diabetes, tuberculosis
Sterculiaceae					
Guazuma ulmifolia Lam.	Mutamba	–	0.20	Flower	Hair

Table 1 (*Continued*)

Family scientific name	Popular name	RI value 1995	RI value 2002	Part used	Indications
Turneraceae					
Turnera ulmifolia L.	Chanana	–	–	Leaf	No therapeutic indication known to the interviewees
Verbenaceae					
Lippia alba (Mill.) Brow	Erva Cidreira	–	0.99	Leaf	Tranquilizer, excitation, colic, anemia in children, magical-religious
Vitex agnus-castus L.	Liamba	–	–	Leaf	Magical-religious
Vitaceae					
Cissus sp.	Insulin	–	0.40	Root, leaf	Diabetes
Zingiberaceae					
Alpinia speciosa Schum.	Colônia	1.33	0.59	Leaf, flower	Fever, sinusitis, headache, influenza, magical-religious
Zingiber officinal Rosc.	Ginger	–	0.20	Root	Throat problems
Unidentified 1	Cipó cabeludo	–	0.40	Root, leaf, stem	Impotency, kidneys
Unidentified 2	Acançuz	–	0.59	Root	Tranquilizer, tiredness, coughing, throat inflammation
Unidentified 3	Chá preto	–	0.40	Seed	Live, kidneys
Unidentified 4	Angélica	–	0.20	Root	Diabetes
Unidentified 5	Arnica	–	0.20	Leaf	Blood circulation problems
Unidentified 6	Arruda da praia	–	0.20	Root, stem, leaf	Late periods
Unidentified 7	Assênia	–	0.20	Leaf	–
Unidentified 8	Ave maria	–	0.20	Leaf	Headache
Unidentified 9	Biratanha	–	0.49	Bark	Kidney inflammations, urethra inflammations, spine inflammations
Unidentified 10	Cebola cheim-cheim	–	0.29	Bulb	Coughing, influenza
Unidentified 11	Cipó de vaqueiro	–	0.81	Leaf, root	Swelling, impotency, weakness
Unidentified 12	Cordão de Frade	–	0.20	Flower	Ulcer
Unidentified 13	Durinho	–	0.81	Root	Impotency, hepatitis, nerves
Unidentified 14	Esquentais	–	0.40	Whole plant	Impotency, high blood pressure, nerves
Unidentified 15	Imbira	–	0.40	Seed	Inflammations, pains
Unidentified 16	Liga osso	–	0.29	Whole plant	Fractures, rheumatism
Unidentified 17	Manjarra	–	0.20	Leaf	Cancer, gastritis
Unidentified 18	Milona	–	0.61	Leaf	Cancer, osteoporosis, gastritis
Unidentified 19	Paratudo	–	0.20	Stem	All diseases
Unidentified 20	Patichuli	–	0.40	Leaf	Fever, high blood pressure
Unidentified 21	Pau Amarelo	–	0.40	Stem	Diabetes, stomach
Unidentified 22	Picão preto	–	0.61	Stem, leaf, root	Nerves
Unidentified 23	Pirí-pirí	–	0.20	Root	Diabetes
Unidentified 24	Porangaba	–	0.40	Leaf	To lose weight, cholesterol
Unidentified 25	São joão	–	0.20	Flower	Superficial skin fungus
Unidentified 26	Sassafrás	–	1.10	Bark	Blood circulation, spine, kidneys, nerves, stomachache, intestines
Unidentified 27	Sena	–	1.28	Leaf	Digestive, purgative, constipation, to lose weight, liver, inflammations, menstruation
Unidentified 28	Trapiá	–	0.20	Leaf	Pains
Unidentified 29	Urinana	–	0.20	Leaf	Urinary system

Table 2
Richness of the corporal system categories and great indication groups for which the plants are used in the São José Market, City of Recife, State of Pernambuco, northeast Brazil

Category	Number of reported uses	Number of plant species
Undefined pains and illnesses	105	63
Physical and mental debility	15	10
Diseases of the skin and subcutaneous cellular tissues	22	15
Diseases related to the endocrine glands, nutrition, and metabolism	48	26
Diseases of the blood and hematopoietic organs	18	14
Diseases of the skeletal, muscle and connective tissues	14	10
Infectious and parasite-related diseases	25	15
Sexual impotency	1	1
General inflammations	49	20
Neoplasies	7	6
Problems of the circulatory system	54	38
Problems of the digestive system	107	49
Problems of the genitourinary system	70	44
Problems of the nervous system	46	25
Problems of the respiratory system	128	43
Problems of the sensorial system (eye)	2	2
Problems of the sensorial system (ear)	7	7

There is no hard distinction made between medicinal and toxic plants sold in the markets that were surveyed, although the vendors recognize that the indiscriminant use of these plants could lead to serious or even fatal accidents. The herbalists who act as "doctors" prescribe the plants to be used and the appropriate dosages for each therapeutic end, although accidents are not uncommon and have been reported in the local newspapers. According to our informants these poisonings result from the incorrect use of these plants or from their use as abortive agents.

4.4. Plants with magical-religious applications

The species destined for the magical-religious practices of the Afro-Brazilian cults represent an expressive group of commercialized plants. These plants are used in blessings, baths, and drinks. These are plants employed from a magical-prophylactic perspective, with the aim of warding off diseases of "unnatural" origin. They are used as amulets – tucked behind the ear or carried in shirt or pants pockets – or cultivated in places that must be protected from evil energies. *Ruta graveolens* L. and *Jatropha gossypiifolia* L. are two examples of plants widely used as described in all of Brazil.

Plants used in bathing are common in initiation rituals or are used as agents of magical therapy. In the case of the initiation baths, the initiate must carry out several obligations that involve periods of reclusion, avoiding certain foods, and baths that serve to catalyze the energy of divine entities linked to newborns. As such, there is a folk plant classification system that guides and directs their use. Plants with yellow flowers, usually Asteraceae (e.g. *Melampodium divaricatum* DC. and *Wedelia trilobata* (L.) Hitch.), for example, are classified as belonging to the Oxum entity of the Afro-Brazilian divinities, a feminine entity linked to gold and to water (Barros, 1993; Albuquerque, 2006a).

Due to these ritualistic obligations, the public market also becomes a place for religious peregrinations that the initiate must visit in order to acquire the products needed to fulfill his/her religious obligations (Vogel et al., 1993). At other times, baths are indicated to treat diseases with magical connotations, such as offensive magic sent by other parties, the influence of malignant spirits, or to avoid punishment from the divinities for negligence of spiritual duties. In this context, plants act as sources of healing energy or as transferring agents, receiving the negative energy that people carry (often the principal behind ritual blessings). The species principally requested for preparing different ritual baths were: *Ocimum basilicum* L., *Aeollanthus suaveolens* Mart. ex Spreng., *Vitex agnus-castus* L., *Ocimum americanum* L., *Lygodium volubile* Sw., and *L. venustum* Sw. These two last species are particularly sought after for the so-called "cleansing baths" to remove offensive energies from the body and to allow events to go well in life, especially in regards to financial and romantic questions.

Plants used in religious drinks are also highly sought after *Mimosa tenuiflora* (Wild.) Poir. ("jurema-preta") stands out as being employed in indigenous and Afro-Brazilian rituals for its psychotropic effects (Mota and Albuquerque, 2006). This plant can be used alone or in combination with other species such as *Anadenanthera colubrina* (Vell.) Brenan and *Anacardium occidentale* L. in a mixture made with alcohol, wine, or "cachaça" (the local distilled drink). To improve the taste of the beverage, and reduce its astringency, aromatic plants such as *Pimpinella anisum* L. can be added. In Afro-Brazilian religious groups, this drink serves to evoke spirits for counseling or medical diagnosis by opening a window to the spirit world (Mota and Albuquerque, 2006). Although the use of psychotropic substances is commonly interpreted in a symbolic perspective, at least one of us believes it also has an adaptative role (a more materialistic perspective—psychotropic adaptation hypothesis) as an instrument to assist younger generations in learning about the natural world (Albuquerque, 2001).

5. Conclusions

Our results suggest that markets are open and dynamic systems that tend to conserve their repertoire while at the same

time allowing for the addition of new plants and their respective indications. Using relative importance to compare the role of species in distinct situations must be undertaken with care, however, as the differences observed derive from the specific context of the use citations and from the nature of the mathematical calculations. Nevertheless, these analyses serve to show that many species have remained important throughout the years. Most medicinal plants are indicated for problems related to primary health care. Despite the fact that some species that are used for both medicinal and magical purposes, there is a clear distinction between their health application and the beliefs that guide their religious use, derived from the strong influence of the Afro-Brazilian religion.

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