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The Influence of Displacement by Human Groups Among Regions in the Medicinal Use of Natural Resource: A Case Study in Diadema, São Paulo - Brazil

Daniel Garcia and Lin Chau Ming

Universidade Estadual Paulista – Faculdade de Ciências Agronômicas
Brazil

1. Introduction

The migration of human groups around the world and the cultural mix of these people has instigated more researches in the field of ethnobotany/ethnopharmacology in recent years (Pieroni & Vandebroek, 2007). Brazil is an example of blending traditional knowledge combined with the use of natural resources to the cure of various diseases and, therefore, have been the subject of several surveys including ethnobotanical and ethnopharmacological. Given the enormous biological diversity and biochemistry in the several biomes around the world and also in Brazil, it is very difficult to find randomly a molecule on which it is possible to develop a competitive drug, acting on a mechanism known and has significant pharmacological properties (FAPESP, 2011). Therefore, the ethnobotany/ethnopharmacology are among the main strategies used for selecting plants to be investigated in laboratorial studies, those with great chances of success (Spjut & Perdue, 1976; Balick, 1990 as cited in Rodrigues, 2005), and is one of the fastest ways to obtain a safe product and pharmacologically active (Giorgetti et al., 2007).

The ethnobotany looks at how people incorporate the plants in their cultural traditions and folk practices (Balick & Cox, 1997) or, according to Alcorn (1995), is the study of the interrelationships between humans and plants in dynamical systems (as cited in Rodrigues et al., 2005).

The ethnopharmacology was originally defined as a science that sought to understand the universe of natural resources (plants, animals and minerals) as drugs used in the view of human groups (Schultes, 1988). However, over time this discipline has evolved and is defined by the INTERNATIONAL SOCIETY FOR ETHNOPHARMACOLOGY as:

“Interdisciplinary study of the physiological actions of plants, animals and others substances used in indigenous medicines of past and present cultures”.

This concept is also currently applied in the case of medicinal substances from non-indigenous people, thus expanding the diversity of information generated in studies ethnopharmacological. The relationship of the biological wealth of the world's diverse
ecosystems, sometimes aided by the traditional knowledge of people who directly depend on these places to survive, is ancient for an extensive possibilities of discovering medicinal formulas for curing various diseases. The multiple possibilities resulting from this combination, natural biodiversity and cultural diversity, give richness and complexity in terms of knowledge about the flora and their therapeutic potential, some studies as: Pieroni & Vandebroek (2007) and Garcia et al., (2010) show that this relationship is even more intrinsic when there is displacement of human groups to a new environment.

Brazil offers a favourable environment for studies focused on migration and medicinal plants/animals because it possesses a large area of 8,514,876.599 km² (IBGE, 2011) and boasts high indices of cultural and biological diversity. In Brazil, the use of herbs for medicinal purposes is a common practice and very diverse, result of intense mixing that occurred during colonization (Europeans and Africans – sixteen to the eighteen century), added with the ancient knowledge of indigenous people, who ever inhabited these lands (Giorgeti et al., 2007).

Brazil is inhabited by mestizo groups derived from the miscegenation of Indian, Black, European and Asiatic people, 232 indigenous ethnic groups (Instituto Socioambiental, 2011) and 1,342 Quilombola groups (descendants of Afro-Brazilian people) (Fundação Cultural Palmares, 2011). Brazil has the richest flora in the world, with nearly 56,000 species of plants (Ribeiro, 1996; Schultes, 1990). For these and other reasons Brazil may be considered a laboratory in situ for a variety of processes that are studied by researchers from diverse fields, including the development of pharmaceutical drugs (Rodrigues, 2007).

However, at present moment, marked by the destruction of natural ecosystems, not only the biodiversity of plants and animals are affected, but also human groups that depend of environments to survive (Davis, 1995).

According to Simões and Lino (2004), the original Atlantic Forest covered approximately 1.3 million km², spanning 17 Brazilian states from south to northeast; however, it currently covers only 14 states, and its area has been reduced to 65,000 km². Despite alarming fragmentation, the Atlantic Forest still contains more than 20,000 plant species (8,000 endemic) and 1,361 animal species (567 endemic). It is the richest forest in the world in wood plants per unit area; the southern Bahia, for example, holds a record of 454 different species/ha (IBAMA, 2011).

Because of this reality, ethnobotanical and ethnopharmacological surveys make an important role in collecting and valuing traditional knowledge of people about the medicinal use of biodiversity in which they live. This assumption, undoubtedly, is the key to preserve the biodiversity of these sites, as well as cultural traditions, once the ignorance on the potential pharmacological importance for the society becomes absent. While migration has become an integral part of modern globalization is as old as human society (Thomas et al., 2009; Waldstein, 2008). There are many reasons why people decide to leave home and live somewhere else, some having reasons within the place of origin, others with perceived opportunities available from the new environment (Findley & De Jong, 1985; Suzuki, 1996). Whatever the reason for the displacement, the migrants experience some difficulties and opportunities due to its displacement to a new location that those who stay behind may not experience (Lacuna-Richman, 2006). Numerous studies have related information on medicinal plants from human groups who migrated from Haiti to Cuba (Volpato et al., 2009); from Mexico to the U.S.A. (Waldstain, 2006, 2008); from Africa to South America
The Influence of Displacement by Human Groups Among Regions in the Medicinal Use of Natural Resource: A Case Study in Diadema, São Paulo - Brazil

(Voeks, 2009); from Africa to Brazil (Carney & Voeks, 2003); from Suriname to the Netherlands (van Andel & Westers, 2010); from Colombia to London (Ceuterick et al., 2008); from Germany to eastern Italy (Pieroni et al., 2004); from Albania to southern Italy (Pieroni et al., 2002a, 2002b); and from Europe and Africa to eastern Cuba (Cano & Volpato, 2004; Pieroni & Vandebroek, 2007). However, few studies have focused on migration within a country, such as that described by Rodrigues et al. (2005) and Garcia et al. (2010) regarding migrants from northeastern Brazil who currently occupy the southeast.

Migration between regions encourages contact with the rich biological and cultural diversity and allows interpersonal interactions that contribute to the transformation of local medicinal therapies. As described by Garcia et al. (2010), where the influence of displacement of people from the Northeast and Southeast Brazil to Diadema (São Paulo) resulted in: maintenance, incorporation, replacement and/or discontinued use of natural resources in their medicinal pharmacopoeia. Migrants bring along their traditions, lifestyles, world and health views, such supporting systems, including knowledge about the use of natural resources to health care and nutrition. These attitudes and practices are held to different ways in the host society (e.g., Nguyen, 2003) and may fall into partial or total disuse, depending of the availability of raw material (Garcia et al., 2010).

This chapter is an attempt to demonstrate the importance that the field ethnobotanist/ethnopharmacological meets in search of new bioactive molecules and how the knowledge about the medicinal use of natural resources can be more diverse and enriched after the displacement of human groups between regions. More broadly and generally, this chapter will also address details of the work done by Garcia et al. (2010) where the authors tried to understand, and comprehend more clearly the extent to which the displacement of people within a country can influence the traditional knowledge about medicinal use of natural resources. We hope this work can contribute significantly to future multidisciplinary research to develop new drugs.

2. Brazilian biodiversity and cultural richness

The Brazilian Atlantic Forest region (Figure 1) was the first to be occupied by European settlers in post-Columbian times (Rodrigues et al., 2008). “Ipe-roxo” (Tabebuia heptaphylla), “cidrão” (Hedyosmum brasiliensis), “marcela” (Achyrocline satureioides), “estévia” (Stevia rebaudiana), “hortelã-do-mato” (Peltodon radicans), “espinheira-santa” (Maytenus spp), “pata-de-vaca” (Bauhinia forficata), “carqueja” (Baccharis trimera), “guaco” (Mikania spp) and “erva-baleeira” (Cordia verbenacea) are some plant species with high chemical and pharmacological potential of the Atlantic Forest biome.

Brazil is very rich in biodiversity, endemism and traditional communities. Is inhabited by diverse ethnic groups, including: Indigenous Ethnic Groups, Quilombo communities, Mestizos, Caïcaras, Fishermen, Rafters, Rubber Tappers, Raizeiros, among other, and the mostly the result of interbreeding between native Indians, Europeans and African elements (Giorgetti et al., 2007).

Native inhabitants of the Atlantic Forest, including non-indigenous, are still in this region, for example, the Caïcaras: people of mixed origin, descendants of European and Native Americans (Rodrigues and Carlini, 2006; Hanazaki et al., 2009). Descendants of Europeans, Africans and Asians settled in Brazil during the colonization and this culminated with
cultural miscegenation of many Brazilian communities and ethnic groups, enriching them culturally. All of these groups have traditionally relied on human resources to treat their illnesses and have at their disposal a rich flora.

According to Rodrigues (2005), human groups that live in the forests are still substitutes for laboratory animals, especially in regions where medical treatment is lacking.

The cultural diversity that exists in Brazil is the result of the migration process and miscegenation that begun in the sixteenth century. In this period, were made the first records of the Brazilian medicinal flora (Camargo, 2000; Giulietti et al., 2005; Rodrigues et al., 2008). Little was known about Brazil at the time of the discoveries. The first Jesuits, explorers, scientists, and settlers who arrived in Brazil, reported a lot of characteristics observed on the new environment (Kury, 2001 as cited in Giorgetti et al., 2007).

The first European explorers that arrived in Brazil found a large number of medicinal plants used by indigenous tribes who lived here. Knowledge of local flora was merged those brought from Europe. Those that migrated from Africa (1530-1888) play an important role in traditional popular knowledge in Brazil until today (Rodrigues, 2007). The Africans who came to Brazil adapted your traditions to the new environment (Rodrigues, 2007).

Due the fusion among human groups from different sites of the world and because of the colonization of the Americas, some plants of temperate climate were brought and introduced in tropical locations (Rodrigues et al., 2008), which made these regions,
especially South America, a biologically rich and diverse field, with emphasis on the Brazilian forests. This mixture of traditions associated with the weight of diversity vegetal has led to a traditional medicine and herbal treatment methods and of different researchers (e.g., such as Garcia et al., 2010; Ming, 1995; Pio Correa, 1926).

Sometimes, researchers focus on ethnobotanical knowledge and practices at one moment in time, where little attention has been given to the “drivers” of change over time, and thus the migration becomes widely accepted as one of the principle means by which vegetal genetic material, associated knowledge and practices are diffused on the globe (Carney, 2001; Carrier, 2007; Niñez, 1987 as cited in Volpato et al., 2008).

In this context, the main forces that guide the changes in the traditional medicinal knowledge, as cited by Volpato (2009) are: (a) the adaptation of the original knowledge to the new (host) environment; and (b) the development of strategies to obtain the original remedies (Pieroni et al., 2005b; Volpato et al., 2007).

3. Displacement of human groups

Ethnomedicine/ethnopharmacology normally does not cease to carry with the changes in a new social context, and it can continue to influence the choices of care and health practices. The life experiences of migrants in new land, in general, and their professional life in particular, significantly influence in their attitudes and care about the range of health care seeking (Han & Ballis, 2007).

People, who move from their region of origin to live in somewhere else, are subject to various factors that may influence their health and pharmacopoeias. For example, a group of people moving from the Northeast to the Southeast of Brazil were faced with a new routine of life, different customs, new diseases and most importantly, a distinct vegetation. This last factor induces the need to seek pharmacological learning about local natural biodiversity, which can enrich the knowledge of the information ethnopharmacological.

Bharat et al. (2008) mentions that before Lepcha tribe get in Sikim southwest of Tibet, they migrated to Thailand, Burma, Bhutan and Assam during the course of migration, they could collect important information along the way, which was about the use of wild plants available in these sites and important pharmacological characteristics of plants associated with the welfare of humanity local as well as the efficiency that these drugs had to save his life. In turn, in Sikkim, they encountered many new plant species and developed their pharmacological knowledge about them.

As cited by Ososki et al. (2007), ethnobotanical knowledge is dynamic and may evolves with the exchange, transfer and ownership of information among people adapted to new environments (Lee et al., 2001; Voeks and Leony, 2004). There is often an exchange of knowledge, medicinal plants and cultural traditions when human groups migrate between urban and rural settings (Ososki et al., 2007). Knowledge about the use of medicinal plants is sometimes the only option for many human groups in the treatment of diseases.

Some substances become even promising when they are constantly used by human groups, considering the distances travelled and the consequent exposure to different cultures and vegetal resources(Lee et al. 2001; Ososki et al. 2007).
4. Ethnopharmacological survey among migrants living in the Southeast Atlantic Forest of Diadema, São Paulo, Brazil – A case of study (Adapted of Garcia et al., 2010)

4.1 Methodology

4.1.1 Fieldwork

One of the authors (D. Garcia) spent 14 months (September 2007 to November 2008) in the municipality of Diadema, São Paulo, SP, Brazil (23°41’10”S, 46°37’22”W), selecting, observing and interviewing migrants living in the Atlantic Forest remnants. Diadema is occupied by 394,266 inhabitants (IBGE, 2011), most of whom are migrants from other regions of Brazil. The Atlantic Forest remnants found in this city are rich in plants that are either native or introduced by the influence of those migrants present both in urban and rural areas. Migrants who had relevant knowledge regarding the use of plants and animals for medicinal purposes were selected for interviews following the purposive sampling method (Bernard, 1988). After identifying potential interviewees, the researcher visited them to determine whether they did indeed possess knowledge on medicinal plants and whether they wanted to take part in this study. This ethnopharmacological study was approved by the Ethics Committee of Universidade Federal de São Paulo (UNIFESP’s Ethics Committee on Research 1969/07) and Conselho de Gestão do Patrimônio Genético (No. 02000.001 049/2008-71). The interviewees also signed consent forms granting permission to access their knowledge and collect botanical and zoological material. Personal and ethnopharmacological data from the interviewees were obtained through informal and semistructured interviews (Bernard, 1988) that addressed the following topics: personal details and migration history (name, sex, age, religion, marital status, place of birth, migration, main occupation, grade of schooling) as well as ethnopharmacology (name of natural resource, use, part used, formula, route of administration, contraindications, dosages, restrictions of use). Each medicinal plant was collected in the presence of the person who described it during the interviews, in accordance with the methods suggested by Lipp (1989). The plants’ scientific names were determined by specialists from the Instituto de Botânica do Estado de São Paulo (IB), and vouchers were deposited at the Herbário Municipal de São Paulo (PMSP). The animals collected were placed in glass vials containing 70% ethyl alcohol, and their subsequent identification and deposit were performed by zoologists from the Museum of Zoology, Universidade de São Paulo (MZUSP) and the Bioscience Institute from Universidade de São Paulo (IB-USP). When interviewees cited plants and animals that were used only in their cities of origin, i.e., not available in Diadema, photos from the literature and other information (e.g., popular name, habits and habitat) were used to identify them to at least the genus level. These organisms are marked with asterisks throughout the text and in Table 1. The Herpetofauna of the Northeast Atlantic Forest (Freitas & Silva, 2005) and The Herpetofauna of Caatingas and Altitudes Areas of the Brazilian Northeast (Freitas & Silva, 2007) were used as identification guides. For plants, the authors also consulted Medicinal Plants in Brazil - Native and Exotic (Lorenzi & Matos, 2008).

4.1.2 Database survey

For the plants and animals identified to the species level, the authors searched the bibliographic databases PUBMED (2011) and SCIFINDER (2011) to determine whether they
had been targets of previous pharmacological studies. To determine the origin of each plant species, was consulted the Dictionary of Useful Plants: exotic and native (Pio Corrêa, 1926).

4.1.3 Dynamics of use

During the field work, the authors made an effort to understand the dynamics of use for each resource and classified them into the following four categories: maintenance of use (resource used for the same purpose in the migrant’s city of origin and in Diadema), replacement (resources that were replaced when migrants arrived in Diadema because the original product was not available in Diadema or was less effective than the new resource), incorporation (resources used for the first time in Diadema to treat diseases common to larger cities, such as hypertension, diabetes and anxiety, which were not common in their homeland), and finally discontinued use (resources that are no longer used in Diadema, usually because they are not available).

4.1.4 Data analysis

The level of homogeneity between plant information provided by different migrants was calculated using the Informants’ Consensus Factor, Fic (Trotter & Logan, 1986). This term is calculated as $Fic = \frac{Nur - Nt}{Nur - 1}$, where $Nur$ is the number of use reports from informants for a particular plant-usage category and $Nt$ is the number of taxa or species used for that plant usage category across all informants. Values range between 0 and 1, with 1 indicating the highest level of informant consent. For instance, if certain taxa are consistently used by informants, then a high degree of consensus is reached and medicinal traditions are viewed as well-defined (Heinrich, 2000).

4.2 Results and discussion

4.2.1 Migrant interviews

Despite the fact that Diadema is composed by thousands of migrants, the authors could observed that only a few had retained traditional knowledge pertaining to medicinal plants and animals. During this time the authors observed that in many cases, this knowledge has fallen into disuse because of: a) a cultural adaptation to the new city, b) the ease of conventional medical care, c) forest degradation, which restricts use of local plants and animals, furthermore d) many migrants have shown concern to participate in the study, since in the past they suffered persecution from government agencies and physicians, who eventually restrained their medical practice. The five selected interviewees migrated from northeast and southeast Brazil and established themselves in Diadema in the 1940s. Three were born in the northeast: two in Pernambuco state (coded as PE1 and PE2) and one in Sergipe state (SE1). The two remaining migrants were born in the southeast: one in Minas Gerais state (MG1) and one in inland São Paulo state (SP1) (Figure 2). All interviewees were Catholic, married and retired, with the exception of PE1 and PE2 who sell medicinal plants. Their average age was approximately 68 years old (ranging from 53 to 80 years old), and their level of education was semi-illiterate to illiterate. They learned about the medicinal uses of plants and animals from their parents and grandparents (Brazilian natives, European and African descendants) in their homelands. All interviewees arrived in the city of
Diadema as adults, and some had migrated through different regions of Brazil, accumulating knowledge on natural resources from human and biological sources. In Diadema, they acquired knowledge from neighbours, books, media (radio, television, magazines), and personal experiences.

4.2.2 Plants: Dynamics of use

The migrants described their knowledge of 85 plant specimens. As can be seen in Table 1, 78 of them were available in Diadema and were collected, resulting in 65 plant species, the remaining 13 could only be identified to the generic level. The plants belong to 37 taxonomic families, with Asteraceae (16 species), Lamiaceae (8) and Euphorbiaceae (7) as the most common. Previous studies have shown that Asteraceae species are the group most commonly reported to have potential pharmacological properties, not only in the Atlantic Forest (Almeida & Albuquerque, 2002; Begossi et al., 1993; Di Stasi et al., 2002) but also in other Brazilian biomes such as the Amazon Forest (Rodrigues, 2006) the pantanal wetlands (Rodrigues & Carlini, 2004) and the cerrado savannahs (Rodrigues & Carlini, 2005). In a review focusing on plants with possible action/effects on the central nervous system that were indicated by 26 Brazilian indigenous peoples occupying different Brazilian biomes (Rodrigues et al., 2005), Asteraceae was the second most commonly cited family. The same

Fig. 2. Location of the Municipality of Diadema, in São Paulo state, southeastern Brazil (black square). Interviewees' migration from their cities of origin to Diadema, being PE (Pernambuco state), SE (Sergipe), MG (Minas Gerais) and SP (São Paulo), and the distance of the displacement (in Km) in each case (adapted of García et al., 2010).
pattern has been detected in other countries, such as Mexico (Díaz, 1977). One factor that may explain the common use of this taxonomic family is the large number of species belonging to it - about 20,000 (Woodland, 1997). Asteraceae also has a wide geographical distribution, both in Brazil and throughout the world (Schultes & Raffauf, 1990), which facilitates its use by various cultures. From the 65 species identified, it was observed that 33 are native to Brazil while the other 32 are exotic, demonstrating the great floral diversity of the region, which was influenced by European and African people during the civilizing process in Brazil. Furthermore, of the 78 specimens recorded, 54% (42) are spontaneous or were already available in Diadema when interviewees arrived there, while 46% (36) were grown by the migrants, acquired in free markets, or brought from other regions of the country during migration. Below, the authors describe the four ‘dynamics of use’ categories observed during this study.

4.2.3 Maintenance of use

According to the interviewees, 68 of the 78 specimens cited in the present study, were used in their homelands (highlighted with □ in Table 1). The maintenance of their uses was possible since most of them were available in Diadema, though some were brought from their homelands. SE1 brought four plants from Aquidabã - Sergipe state, for pain relief because they are not available or are more potent than the ones found in Diadema: “bálsamo” (*Sedum* sp.), “anador” (*Alternanthera* sp.), “eucalipto/vick” (*Eucalyptus globulus* Labill.) and “novalgina” (*Achillea millefolium* L.).

4.2.4 Incorporation of use

Fourteen of the 78 specimens listed in Table 1 came to be used by migrants when they arrived in Diadema (highlighted with △ in Table 1). These incorporations occurred in several ways: through information given by neighbours; through local media, e.g., television, radio, magazines; or through personal efforts, guided by plant organoleptic properties or even by the theory of signatures. This theory, formulated by Paracelsus (XVI century), assumes that characteristics and virtues of herbs can be recognised by their external appearance or “signature” (picture, shape, colour). Finally, observing the relationship between animals and plants can be a valuable guide. PE1 noted that dogs consume “sete-sangria” (*Cuphea carthagenensis* (Jacq.) J. F. Macbr.) when they have diarrhoea; and because it seemed to alleviate their symptoms, he started to use this plant for the same purpose. The migrants incorporated several plants after their arrival in Diadema to treat typical diseases of larger cities: “cipó-cruz” (*Serjania* sp.) to combat high cholesterol; and “guanxuma” (*Sida rhombifolia* L.) and “guiné” (*Petiveria alliacea* L.) for anxiety. Also included in this category was knowledge concerning local toxic plants, e.g., alamanda-amarela (*Allamanda cathartica* L.) and azaléia (*Rhododendron simsii* Planch.), detailing the risks associated with their consumption.

Similar results were recorded by Volpato et al. (2009), where the use of some plants have been incorporated in Cuban pharmacopoeia by the Haitians. This occurred, according to the authors, as a result of factors such as cultural contact and exchange of information between migrants and host, and personal experimentation or imitation of local practices by migrants. The same authors conclude that Haitians contributed to what is today considered as traditional Cuban medicine by introducing into the dominant Cuban community practices and uses of plants.
<table>
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<th>Origin - geographical distribution - cultivated (C) or spontaneous (S)</th>
<th>Use (part)</th>
<th>Formula and route of administration</th>
<th>Pharmacological studies</th>
</tr>
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<td>Bicalho pilosa L. (Asteraceae) Garcia 020</td>
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<td>Blood purifier (whole plant), Healing wounds* (whole plant), Wounds in the body* (roots)</td>
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<td>Specimen (family)</td>
<td>Voucher code</td>
<td>Popular(s) name(s) (migrant)</td>
<td>Dynamic of use</td>
<td>Origin – geographical distribution – cultivated (C) or spontaneous (S)</td>
<td>Use (part)</td>
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<tr>
<td>Bryophyllum pinnatum</td>
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<td>Folha-santa, folha-da-fortuna</td>
<td>Exotic</td>
<td>Brazilian territory (C)</td>
<td>Lumbar pain* (leaves) Sedative* (leaves)</td>
</tr>
<tr>
<td>Calliandra cinerea</td>
<td>Garcia 003</td>
<td>Feijão-guardu</td>
<td>Exotic</td>
<td>Brazilian territory (C)</td>
<td>Bronchitis (leaves)</td>
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<tr>
<td>Calycella sp.</td>
<td>Garcia 036</td>
<td>Picão (MGI)</td>
<td>No data</td>
<td>Diuretic</td>
<td>Infusion - ingestion</td>
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<tr>
<td>Carapa papaya L.</td>
<td>Garcia 062</td>
<td>Mamão-papaya</td>
<td>Exotic</td>
<td>Brazilian territory (C)</td>
<td>Bronchitis* (powder fruit)</td>
</tr>
<tr>
<td>Cereus paludosus Trép.</td>
<td>Garcia 068</td>
<td>Emaulá (MGI, SEI)</td>
<td>Native - south to northeast Brazil (S)</td>
<td>Bronchitis* (powder fruit)</td>
<td>Toxic (sap)</td>
</tr>
<tr>
<td>Chrysopogon ambrosioides L.</td>
<td>Garcia 006</td>
<td>Mentru, erva-de-santa maria</td>
<td>Native - south and southeast Brazil (S)</td>
<td>Muscle pain (aerial parts) Lesion in bone (aerial parts) Worm* (aerial parts) Bronchitis (aerial parts)</td>
<td>Decoction - Massage In natura - Plaster Infusion - Ingestion Syrup - Ingestion</td>
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<tr>
<td>Citrus sp. (Vitaceae)</td>
<td>Garcia 053</td>
<td>Sobre-do-rimquem-squé (MGI)*</td>
<td>No data</td>
<td>Kidney stone (leaves)</td>
<td>Infusion - ingestion</td>
</tr>
<tr>
<td>Citrus aurantium (Chamis.,) Swingle (Rutaceae) Garcia 065</td>
<td>Limão (MGI)</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Fever (leaves)</td>
<td>Infusion - ingestion</td>
<td>Mosquito repellent activity (Das et al., 2003)</td>
</tr>
<tr>
<td>Coffea arabica L. (Rubiaceae) Garcia 030</td>
<td>Café (MGI)*</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Diabetes (ripe fruits) Sinusitis (powder fruit)</td>
<td>Infusion</td>
<td>Antioxidant (Berson, 2008)</td>
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<tr>
<td>Corylus avellana (Jacc.) Hance (Corylaceae) Garcia 019</td>
<td>Caju-do-broho (SPL, PE2i)</td>
<td>Native - northeast and southeast Brazil (S)</td>
<td>Nuts and rhematism (leaves)</td>
<td>Infusion or decoction - ingestion</td>
<td>Antiurolithiatic (Araújo et al., 1999)</td>
</tr>
<tr>
<td>Cuscuta japonica (SS)</td>
<td>Garcia 013</td>
<td>Velando (SEI)*</td>
<td>Native - Brazilian territory (S)</td>
<td>Inhibits the growth of skin stains/wounds in the body (resin)</td>
<td>In natura - topic</td>
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</table>

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<table>
<thead>
<tr>
<th>Specimen (family)</th>
<th>Voucher code</th>
<th>Popular(s) name(s) (migrant) dynamic of use</th>
<th>Origin - geographical distribution - cultivated (C) or spontaneous (S)</th>
<th>Use (part)</th>
<th>Formula and route of administration</th>
<th>Pharmacological studies</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Caphra carthagenensis</em> (Jacq.) F. Machr. (Lythraceae)</td>
<td>Garcia 007</td>
<td>Seta-sangria (MGI; SPI, SEI)</td>
<td>Native - Brazilian territory (S)</td>
<td>Intestinal infections and heart problems* (aerial parts)</td>
<td>Infusion - ingestion</td>
<td>Anti-inflammatory and antinecrotic activities (Schapoval et al., 1998), vasorelaxant properties (Schuldt et al., 2000), treat high levels of cholesterol and triglycerides (Ravotti et al., 2004)</td>
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<tr>
<td><em>Cymbopogon citratus DC.</em> - Stapf. (Poaceae)</td>
<td>Garcia 026</td>
<td>Cappim-limão (MGI; SEI, PE)</td>
<td>Exotic - tropical countries (C)</td>
<td>Bronchitis* (leaves)</td>
<td>Syrup - ingestion</td>
<td>Antioxidic (Palmier, 2000), larvicial activity (Cavalcani et al., 2004), antibacterial (Warrienson et al., 2003), antimalarial activity (Tchouboungang et al., 2005), insect repellent (Moore et al., 2007), hypoglycemic and hypolipidemic effects (Adeneye et al., 2007) and antimicrobial activity (Nogueira et al., 2008)</td>
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<tr>
<td><em>Dioon eschweileri</em> sp. (Araeaceae)</td>
<td>Garcia 071</td>
<td>Comigo-ninguidum-pode (PE)</td>
<td>No data (C)</td>
<td>Toxic (whole plant)</td>
<td>Any oral dose is dangerous</td>
<td>Not consulted</td>
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<tr>
<td><em>Eupatorium barbense</em> L. (Euphorbiaceae)</td>
<td>Garcia 053</td>
<td>Cavalinha (MGI)</td>
<td>Exotic (C)</td>
<td>Diuretic (leaves)</td>
<td>Infusion - ingestion</td>
<td>No data found</td>
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<tr>
<td><em>Eucalyptus globulus</em> Labill. (Myrtaceae)</td>
<td>Garcia 055</td>
<td>Eucalipto, vick (MGI; PE, SEI)</td>
<td>Exotic (C)</td>
<td>Sinusitis* (leaves)</td>
<td>Infusion - inhalation</td>
<td>Antiinflammatory actions (Gray &amp; Platt, 1998), analgesic and anti-inflammatory effects (Silva et al., 2003), antimicrobial activity (Takahashi et al., 2004) and antibacterial effects (Sakairi et al., 2006)</td>
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<tr>
<td><em>Euphorbia heterophylla</em> L. (Euphorbiaceae)</td>
<td>Garcia 047</td>
<td>Amendoim-bravo, burra-leiteira (MGI, SPI, SEI, PE, PE)</td>
<td>Native - Americas (S)</td>
<td>Toxic* (whole plant)</td>
<td>Any oral dose is dangerous</td>
<td>Cytotoxic properties (De Almeida Barbosa et al., 2006)</td>
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<tr>
<td><em>Euphorbia tirucalli</em> L. (Euphorbiaceae)</td>
<td>Garcia 046</td>
<td>Avelelo (PE, PE)</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Toxic* (whole plant) Breast cancer* (latex) Restricted use (report of blindness) Macerate - ingestion</td>
<td>Anti-tumour activity (Valadares et al., 2006), cause eye injury (Shianovcovitz et al., 2007) and effect against arthritis diseases (Ban et al., 2007)</td>
<td></td>
</tr>
<tr>
<td>*Fenugreek vell. (Cucurbitaceae) Garcia 022</td>
<td>Fucunã (SEI)</td>
<td>Native - North and southeast Brazil (S)</td>
<td>Toxic - abortive (seeds)</td>
<td>In natura - ingestion</td>
<td>No data found</td>
<td></td>
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<tr>
<td>*Fermicium suaveire Mill. (Apiceae) Garcia 064</td>
<td>Limia-doce, funcho (MGI, SEI, PE, PE)</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Sedative (whole plant) Bronchitis* (whole plant) Laxative (whole plant)</td>
<td>Infusion - ingestion Infusion - Inhalation Infusion or macerate - ingestion</td>
<td>Antimicrobial activity (Ando et al., 2002), anti-inflammatory, analgesic and antioxidant activities (Choi et al., 2004), acaricidal activity (Lee, 2004), antifungal effect (Oxtan et al., 2006), antiphlogistic activity (Tognolani et al., 2007) and larvicial activity of the mosquito Aedes aegypti (Pitasawat et al., 2007)</td>
<td></td>
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<tr>
<td>*Gympie tree sp. (Malvaceae) Garcia 006</td>
<td>Aldegã (MGI)</td>
<td>No data (C)</td>
<td>Anti-inflammatory (leaves)</td>
<td>Infusion - inhalation</td>
<td>Not consulted</td>
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<tr>
<td><em>Hyphaene sp.</em> (Asparagaceae)</td>
<td>Garcia 029</td>
<td>Almeirão-boca-de-leite (SEI)</td>
<td>No data (S)</td>
<td>Pain (leaves)</td>
<td>In natura - ingestion</td>
<td>Not consulted</td>
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<tr>
<td><em>Hypphris sp.</em> (Lamiaceae)</td>
<td>Garcia 041</td>
<td>Sumba-caitã (SEI)</td>
<td>No data (S)</td>
<td>y aache (leaves)</td>
<td>In natura - ingestion</td>
<td>Not consulted</td>
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<tr>
<td>Specimen (family)</td>
<td>Voucher code</td>
<td>Popular(s) name(s) (migrant) dynamic of use</td>
<td>Origin - geographical distribution - cultivated (C) or spontaneous (S)</td>
<td>Use (part)</td>
<td>Formula and route of administration</td>
<td>Pharmacological studies</td>
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<tr>
<td>Impatiens fumarii W. Bull.</td>
<td>044</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Toxic (whole plant)</td>
<td>In closed environment causes tearing, allergy and headache</td>
<td>No data found</td>
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<tr>
<td>Jacaranda sp.</td>
<td>012</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Decoction - bath</td>
<td>Not consulted</td>
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<tr>
<td>Jatropha gossypifolia</td>
<td>017</td>
<td>Native - southeast to northeast Brazil (S)</td>
<td>Laxative (powder fruit)</td>
<td>In natura - ingestion</td>
<td>Antimarial effects (Gomes et al., 1989), hypertensive and vasorelaxant effects (Almeida et al., 2003)</td>
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<tr>
<td>Lecanopsis olivacea (Lam.)</td>
<td>002</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Heating wounds* (aerial parts)</td>
<td>In natura - plaster</td>
<td>Stimulating action on the uterus (Sah et al., 1996), analgesic and anti-inflammatory activity (Islam et al., 2005) and antibacterial activity (Ahmed et al., 2006)</td>
<td></td>
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<tr>
<td>Lippia alba (Mill.)</td>
<td>005</td>
<td>Native - almost all Brazilian territory (S)</td>
<td>Infusion - Inhalation</td>
<td>Treatment of respiratory diseases (Cáceres et al., 1991), antitussive activity (Pascual et al., 2001), sedative and anticonvulsant effects (Zöllker et al., 2002), antiinflammatory and antihyper (Andrighetti-Fröhner et al., 2005)</td>
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<tr>
<td>Lysimachia sp.</td>
<td>078</td>
<td>No data (S)</td>
<td>Hemorrhoid (whole plant)</td>
<td>Decoction - bath</td>
<td>Not consulted</td>
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<tr>
<td>Malva neglecta L.</td>
<td>059</td>
<td>Exotic - southeast south Brazil (S)</td>
<td>Wounds in the body (roots)</td>
<td>Medicinal wine - ingestion</td>
<td>Skin anti-aging property (Talbouret et al., 2007)</td>
<td></td>
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<tr>
<td>Mappi oxyacantha</td>
<td>060</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Conjunctivitis* (eye) (dew on the leaves)</td>
<td>In natura - topical</td>
<td>Analgesics and anti-inflammatory effects (Adeleye et al., 2008)</td>
<td></td>
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<tr>
<td>Mentha arvensis</td>
<td>031</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Bronchitis* (leaves)</td>
<td>Syrup - ingestion</td>
<td>Antifungal property (Towari et al., 1999), vasodilatory actions (Runnle et al., 2004), antioxidative activity (Ka et al., 2005), antibacterial properties (Wannasorn et al., 2005) and insect repellent and fumigants (Moore et al., 2007)</td>
<td></td>
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<tr>
<td>Mentha pulegium</td>
<td>029</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Bronchitis* (leaves)</td>
<td>Syrup - ingestion</td>
<td>Larvicidal activity (Cotin et al., 2006), acaricidal effects (Kim et al., 2006) and insecticidal properties (Pavela, 2008)</td>
<td></td>
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<tr>
<td>Mimosa gynomata</td>
<td>032</td>
<td>Native - northeast to southeast Brazil (S)</td>
<td>Bronchitis* (leaves)</td>
<td>Syrup - ingestion</td>
<td>Analgesic and anti-inflammatory activities (Ruppel et al., 1991), bronchodilator activity (Soares et al., 2002) and antiangiogenetic properties (Maiorano et al., 2005)</td>
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<tr>
<td>Mimosa pudica L.</td>
<td>069</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Healing wounds* (aerial parts)</td>
<td>In natura - plaster</td>
<td>Antidepressant activity (Molina et al., 2005), antitoxin of the snake Naja kaouthia (Mahanta et al., 2001), anticonvulsant (Ngo et al., 2004) and for reproductive problems (Law, 2007)</td>
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<tr>
<td>Mirabilis jalapa L.</td>
<td>065</td>
<td>Native - Brazilian territory (C)</td>
<td>Healing wounds* (aerial parts)</td>
<td>Infusion - plaster</td>
<td>Antibacterial effect (Kusama et al., 1991) and antimicrobial (Shao et al., 1999)</td>
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<tr>
<td>Specimen (family)</td>
<td>Voucher code</td>
<td>Populare(s) name(s) (migrant) dynamic of use</td>
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<td>Formula and route of administration</td>
<td>Pharmacological function</td>
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<tr>
<td>Pauca annulata Pers. (Euphorbiaceae)</td>
<td>Garcia 061</td>
<td>Cytolytic (MGI)</td>
<td>Fruiting (C)</td>
<td>Syrup - ingestion</td>
<td>Anti-infective, antifungal, antioxidant activity</td>
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<tr>
<td>Psidium guajava L. (Myrtaceae)</td>
<td>Garcia 060</td>
<td>Native - Brazil (S)</td>
<td>Exotic - Brazil (C)</td>
<td>Syrup - ingestion</td>
<td>Anti-infective, antifungal, antioxidant activity</td>
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<td>Pothos aureus L. (Asteraceae)</td>
<td>Garcia 063</td>
<td>Native - Brazil (S)</td>
<td>Exotic - Brazil (C)</td>
<td>Syrup - ingestion</td>
<td>Anti-infective, antifungal, antioxidant activity</td>
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<tr>
<td>Psidium guajava L. (Myrtaceae)</td>
<td>Garcia 060</td>
<td>Native - Brazil (S)</td>
<td>Exotic - Brazil (C)</td>
<td>Syrup - ingestion</td>
<td>Anti-infective, antifungal, antioxidant activity</td>
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<tr>
<td>Pseudopanax communis L. (Pneumoniales)</td>
<td>Garcia 065</td>
<td>Native - China (S)</td>
<td>Fruiting (C)</td>
<td>Syrup - ingestion</td>
<td>Anti-infective, antifungal, antioxidant activity</td>
<td></td>
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<tr>
<td>Specimen (family)</td>
<td>Popular(s) name(s) (migrant) dynamic of use</td>
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<tr>
<td>Ruta graveolens L.</td>
<td>Arruda (MG1, PE1, PE2)</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Earache and conjunctivitis/sty/l* (leaves)</td>
<td>Decoction - massage</td>
<td>Anti-fertility (Gandhi et al., 1991), fungicide (Oliva et al., 2003), cytotoxic (Ivanova et al., 2005), abortive (De Freitas et al., 2010), anti-tumour (Perezi et al., 2006), anti-inflammatory (Raghav et al., 2006), anti-arrhythmic (Khor et al., 2008) and antimicrobial (Nogueira et al., 2008)</td>
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<tr>
<td>Sambucus canadensis L.</td>
<td>Sabugueiro (MG1)*</td>
<td>Native - Brazilian territory (S)</td>
<td>Bronchitis* (flowers)</td>
<td>Syrup - ingestion</td>
<td>Infectious diseases and antioxidant activity (Holetz et al., 2002)</td>
<td></td>
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<tr>
<td>Schinus terebinthifolius</td>
<td>Aroeira (MG1)*</td>
<td>Native - northeast to south Brazil (S)</td>
<td>Diuretic (leaves)</td>
<td>Infusion - ingestion</td>
<td>Antifungal activity (Schmouzio et al., 2005) and antibacterial (De Lima et al., 2006)</td>
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<tr>
<td>Scoparia dulcis L.</td>
<td>Vassourinha (SE1, PE2)*</td>
<td>Native - Brazilian territory (S)</td>
<td>Hip pain/kidneys (leaves)</td>
<td>Decoction - bath</td>
<td>Antitumor-promoting activity (Nishino et al., 1993), antioxidant (Katrasaeiyi et al., 2000), antimicrobial and antifungal activities (Latha et al., 2006)</td>
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<tr>
<td>Sedum sp. (Crassulaceae)</td>
<td>Balasmo (MG1, SP1, PE3, SE1)</td>
<td>No data (C)</td>
<td>Barache (leaves) Laxative (aerial part)</td>
<td>In natura - topic - In natura - ingestion</td>
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<tr>
<td>Senega pendula</td>
<td>Fedegoso (MG1)*</td>
<td>Native - Brazilian territory (S)</td>
<td>Osteoporosis prevention (roots)</td>
<td>Medicinal wine - ingestion</td>
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<td>Serjania sp.</td>
<td>Cipó-cruz (SE1, PE2)*</td>
<td>No data (S)</td>
<td>Reduces cholesterol and diaries (leaves)</td>
<td>Macerate - Ingestion</td>
<td>Not consulted</td>
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<td>Sida rhombifolia L.</td>
<td>Guaranxua (SE1)*</td>
<td>Exotic - Brazilian territory (S)</td>
<td>Sedative (aerial parts)</td>
<td>Infusion - ingestion - Infusion - bath</td>
<td>Cytotoxicity, antibacterial activity (Islam et al., 2003) and antioxidant (Dhalwal et al., 2007)</td>
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<td>Solanum americanum L.</td>
<td>Maria-pretozinha (MG1)*</td>
<td>Native - Americas (S)</td>
<td>Score throat* (aerial parts)</td>
<td>Infusion - gargle</td>
<td>Treatment of protozoal infections (American trypanosomes) (Cáceres et al., 1998) and moderate antioxidant activity (Tavekwa et al., 2009)</td>
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<tr>
<td>Solanum tuberosum Mart.</td>
<td>Tutubebá (MG1, SE1, PE2)</td>
<td>Native - southeast and south Brazil (S)</td>
<td>Sedative (leaves) Laxative (powder fruit)</td>
<td>Infusion - Ingestion - In natura - ingestion</td>
<td>Antiallergenic activity (Antonio et al., 2004)</td>
<td></td>
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<tr>
<td>Stachys officinalis L.</td>
<td>Serrilha (PE1)*</td>
<td>Exotic - Brazilian territory (S)</td>
<td>Diabetes (leaves)</td>
<td>In natura - ingestion</td>
<td>Larvicidal potential (Shama et al., 2006)</td>
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<tr>
<td>Stachys trachycaulis (Rich.) Vahl (Verbenaceae)</td>
<td>Germão (MG1)*</td>
<td>Native - Brazilian territory (S)</td>
<td>Laxative (aerial part)</td>
<td>Infusion or decoction - Ingestion</td>
<td>Anti-inflammatory and anti-ulcerogenic properties (Penido et al., 2006) and hypoglycaemic constituents (Adibajo et al., 2007)</td>
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</table>
their popular and scientific names, geographical origin and distribution, if cultivated or spontaneous, uses, part administration and pharmacological studies. Marked by (□) the 68 plants whose use had been maintained by the marked by (△) are those whose applications have been incorporated by migrants, finally, 3 (#) are replacements. *proclaimed by the interviewees and pharmacological data have been posted by (*)

Table 1. The 78 plant specimens used by five Diadema’s migrants (MG1, SP1, PE1, PE2, SE1)* (adapt

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<thead>
<tr>
<th>Specimen (family)</th>
<th>Voucher code</th>
<th>Popular(s) name(s) (migrant)</th>
<th>Dynamic of use</th>
<th>Origin - geographical distribution - cultivated (C) or spontaneous (S)</th>
<th>Use (part)</th>
<th>Formula and route of administration</th>
<th>Pharmacological activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squamellaria granzii Hook. F. (Euphorbiaceae) Garcia 074</td>
<td>Jaraniba (PE1)*</td>
<td>Exotic - south east to northeast Brazil (C)</td>
<td>Toxic (whole plant)</td>
<td>Stomach cancer (latex)</td>
<td>Restricted use</td>
<td>Infusion or in water - ingestion</td>
<td>Healing action</td>
</tr>
<tr>
<td>Proporochrom major L. (Tropaeolaceae) Garcia 057</td>
<td>Capuchinha</td>
<td>Exotic - south and northeast Brazil (C)</td>
<td>Liver and laxative (aerial parts)</td>
<td>Infusion - ingestion</td>
<td>Infusion - Ingestion</td>
<td>Anti-tumor activity</td>
<td></td>
</tr>
<tr>
<td>Vernonia condensata Baker (Asteraceae) Garcia 001</td>
<td>Boldo-do-Chile, frangipil (PE1, SE1)</td>
<td>Exotic - northeast to southeast Brazil (C)</td>
<td>Liver pain (leaves)</td>
<td>Infusion - ingestion</td>
<td>Infusion - Ingestion</td>
<td>Anti-inflammatory</td>
<td></td>
</tr>
<tr>
<td>Vernonia sp. (Asteraceae) Garcia 048</td>
<td>Ana-pêixe (MG1, SE1)</td>
<td>No data (S)</td>
<td>Chills (leaves)</td>
<td>Expectorant (leaves)</td>
<td>Infusion - Ingestion</td>
<td>Not consulted</td>
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<tr>
<td>Poliophora indica L. (Sterculiaceae) Garcia 077</td>
<td>Malva-branca (SE1)*</td>
<td>Native - Brazilian territory (S)</td>
<td>Gingivitis (leaves)</td>
<td>Healing wounds (leaves)</td>
<td>Infusion - Ingestion</td>
<td>Anti-inflammatory</td>
<td></td>
</tr>
<tr>
<td>Zea mays L. (Poaceae) Garcia 023</td>
<td>Milho (SE1)*</td>
<td>Exotic - Brazilian territory (C)</td>
<td>Bronchitis (flowers)</td>
<td>Blood purifier and diuretic (flowers)</td>
<td>Syrup - ingestion</td>
<td>Infusion - Ingestion</td>
<td>No data found</td>
</tr>
</tbody>
</table>
4.2.5 Replacement of use

Three plants used by migrants in their cities of origin were replaced because they were not available or were less effective than plants present in Diadema (highlighted with * in Table 1). Most of these replacements were made according to the criteria listed in the previous section. The interviewee MG1 explained that in his homelands, he used “quebra-pedra”* (Phyllanthus cf. caroliniensis Walter - Euphorbiaceae) for kidney stone disturbance, but when he arrived in Diadema, he found another plant, “sofre-do-rim-quem-quê” (Cissus sp.), that seemed to have a stronger effect.

Another interviewee, PE1, reported that the bark and seeds of “amburana-de-cheiro”* (Amburana cf. cearensis (Allemão) A.C. Sm. - Fabaceae s.l.) were widely used for anti-inflammatory therapy in Pernambuco state but had to be replaced by “mentruz” (Chenopodium ambrosioides L.) because the former was not found in Diadema. In addition, SE1 had to replace “pau-de-sapo”* (Pouteria cf. melinoniana Boehni - Sapotaceae), whose leaves were used for chronic wounds, with “carrapicho” (Acanthospermum australe (Loefl.) Kuntze). The vernacular names of some plants are registered trademarks of allopathic medicines and active ingredients, e.g., Novalgina® (Achillea millefolium) and Vick® (Eucalyptus globulus) for sinusitis, and Anador® (Alternanthera sp.), which is used as a sedative and for general pain. Contact between migrants and allopathic medicine thus led to the ‘baptisms’ of these plants, following the observation that both, the commercially available products and herbal source have similar effects, as reported by Pires et al., (2009).

Biocultural adaptation, negotiation and cultural identity are key-issues for issues anthropological in the displacement of human groups between regions (Belliard & Ramírez-Johnson, 2005; Janes & Pawson, 1986). Research in culturally homogeneous places and/or non-urban has shown that to follow the pattern of changes in traditional knowledge and use of plant among migrants must involve the degree the process of acculturation (Bodeker et al., 2005; Nesheim et al., 2006 as cited in Pieroni & Vandebroek, 2007). This dynamic interaction between migrants and host societies may result in changes pharmacopeial adapted with plants exchanged(Pieroni & Vandebroek, 2007).

4.2.6 Discontinued use

According to MG1, the following plants used in his homeland fell into disuse because they were not found in Diadema, although he tried to acquire them from local commercial sources: “quina”* (Strychnos cf. pseudoquina A. St. Hil - Loganiaceae), whose root is used to combat pain in the stomach and intestine; bark oil of “jatobá”* (Hymenaea cf. courbaril L. - Fabaceae s.l.), used for combat wounds; “batata-de-purga”* (Operculina cf. macrocarpa (L.) Urb - Convovulaceae), whose tuber is ingested as a purgative and to clean the blood; bark and leaf of “jalapa”* (Mirabilis cf jalapa L. - Nyctaginaceae), used to clean the blood; tea of “junco”* (Cyperus cf. esculentus L. - Cyperaceae), whose root is used for inflammation; bark or seed of “embrurana”* (Amburana cf. cearensis - Fabaceae s.l.), used for migraine and sleeping; and bark of “angico”* (Anadenanthera cf. colubrin (Vell.) Brenan - Fabaceae s.l.), prepared as a tea for pain in the body and fever. These plants were not described in Table 1, since they could not be collected and identified as well.
In a study performed by Waldstein (2008), it became clear that there is great influence of the host culture (USA) on the lifestyles of immigrants (Mexicans). The study reports that immigrants go through an intense process of acculturation and loss of traditional knowledge over the years, adopting the lifestyle of the host country. One of the problems that can affect traditional knowledge is the possibility of loss due to migration of people to industrialized regions (Pieroni et al., 2005). Due to contact with a new routine of life and, often, different environments (flora, fauna, culture, food, language, religion) people moving between regions, usually adapt more to the new location (those more culturally flexible) or not (those culturally less flexible) variable which makes the loss or incorporation of traditional knowledge about medicinal use of natural resources. For newcomers to the host country, it seems that the adoption of values, language, beliefs, traditions of the dominant group are constant, but, alternatively, some groups reject this and maintain their traditional customs (Ceuterick et al., 2007). The use of traditional foods, for example, is often seen as a symbol of maintenance ethnic identity and a cultural trait very resistant to change (Nguyen, 2003 as cited in Ceuterick et al., 2007).

4.2.7 Plants used for therapeutic purposes

Of the 78 plants, 10 carry some restrictions, as they can be toxic depending on the dose, route or part utilized (Table 1). The uses described in Table 1 are written just as they were reported by the interviewees. The 68 plants used exclusively for medicinal purposes were cited for 41 complaints, which were grouped into 12 functional categories according to bodily system, as detailed in Table 3. Thus, gastrointestinal disturbances include the following complaints (numbers of medicinal plants reported): endoparasitosis (1), ulcer (1), diarrhoea (1), bellyache (2), heartburn (1), intestinal infections (1), liver pain (3). This category also includes plants used to improve digestion (1), to treat tables of haemorrhoid (1), as laxatives (10) and to purify the stomach (2), comprising a total of 24 plants employed in 44 formulas. The most relevant categories of use, measured by number of species employed, were gastrointestinal disturbances (30.8% of plants), inflammatory processes (24.4%) and respiratory problems (23.1%). As seen in Table 4, the group of illnesses representing immunological problems obtained the highest informant consensus factor value (Fic = 0.66), while the other categories presented Fic values lower than 0.5. These low values reflect the diversity of knowledge displayed by migrants, which can probably be attributed to different cultural influences during their migrations through Brazilian territory. Furthermore, the small number of interviewees may have resulted in low values of Fic. The parts of the plants most often used in the formulas were leaves (45.4%) and other aerial parts (22.7%). The most common formula was the infusion (37.8%), followed by in natura (17.6%) and syrup (10.1%). The most cited route of administration was ingestion (51.3%), followed by inhalation (8.4%) and topical (3.4%).

4.2.8 Plants with restrictions on use and/or toxic

Among the 10 specimens with restrictions on use, 6 were designated as only toxic: “alamanda-amarela” (Allamanda cathartica), “algodão-do-mato” (Asclepias curassavica L.), “amendoim-bravo/burra-leiteira” (Euphorbia heterophylla L.), “azalea” (Rhododendron simsii), “comigo-ninguém-pode” (Dieffenbachia sp.) and “impatiens” (Impatiens hawkeri). The
interviewees explained that depending on the dose, the latex of “alamanda- amarela” and “amendoim-bravo” can cause discomfort or even blindness. According to Oliveira et al. (2003), the leaves of *Dieffenbachia picta* Schott contain calcium oxalate, which damages the oral mucosa and provokes pain and oedema, while the leaves of *Allamanda cathartica* contain cardiotonic glycosides and induce intense gastrointestinal disturbances. Although reported as toxic, the latex of two other plants can be used at low doses to treat breast and stomach cancer: “avelóz” (*Euphorbia tirucalli* L.) and “jarnaúba” (*Synadenium grantii* Hook. F.), respectively. The sap of “embaúba” (*Cecropia pachystachya* Tréc.) was indicated as toxic, but its fruits are used to combat bronchitis. Finally, the seeds of “pucuná” (*Fevillea passiflora* Vell.) are toxic, being indicated as abortive. In a recent study, Rodrigues (2007) also described plants with restrictions of use as reported by three Brazilian cultures: the Krahô Indians use two plants as abortives in a single prescription: “aprytytti” (*Acosmium dasycarpum* (Vogel) Yakovlev) and “ahkryt” (*Anacardium occidentale* L.) (Anacardiaceae); their barks are boiled, and the beverage is ingested at dawn. It is an extremely bitter beverage, rich in tannin and therefore extremely astringent.

### 4.2.9 Pharmacological data

As can be seen in Table 1, 57 species (73.1%) were featured in previous pharmacological studies. For 30 of these species (52.6%), the uses cited by the migrants showed some similarity to the investigated effects/actions, demonstrating concordance between popular knowledge and academic science (marked with an asterisk in Table 1).

### 4.2.10 Animals used for therapeutic purposes and dynamics of use

From the five interviewees, only one (PE2) offered knowledge on the medicinal uses of 12 animals. They belong to four taxonomic classes: Reptilia (6 species), Insects (3), Mammalia (2) and Amphibia (1). However, the interviewee has used only two animals since he arrived in Diadema, the other ten animals fell into disuse because they are not available in this city. The two animals were collected, identified and deposited in the Museum of Zoology-USP: ant (*Atta sexdens* L.) and cockroach (*Periplaneta americana* L.). These species belong to the maintenance of use category (highlighted with $\Box$ in Table 2). The other ten species therefore belong to the discontinued use category (highlighted with $\Omega$ in Table 2) which could not be collected. Their identifications were made by PE2 through consulting images from books (as described in Methodology). For three animals (snake, alligator and giant water bug) PE2 could only hesitantly confirm their identity, probably due to the great diversity of these animals in Brazil. Therefore, they are denoted in Table 2 as probably belonging to one of three possible genera. The animals were used in 14 different medicinal formulas, with the skin most commonly used (33.3%), followed by whole animal (20.0%), bone (13.4%), fat (6.7%), rattle (6.7%), tooth (6.7%), anthill (6.7%) and turtleshell (6.7%). Some studies conducted in Brazil show that concomitant data corroborate and sustain these uses (Alves, 2009; Costa-Neto, 2005; Ferreira et al., 2009; Santos-Fita & Costa-Neto, 2007; Torres et al., 2009). The formulas were cited for the treatment of nine complaints, which were grouped into six functional categories, as shown in Table 5. The most commonly cited formula was powder (66.7%), followed by in natura (20%). The most frequent route of administration was ingestion (78.6%). The most common complaint involved respiratory problems (58.4%; 7 animals) followed by central nervous system (8.3%), inflammatory processes (8.3%),

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<table>
<thead>
<tr>
<th>Scientific name or only genus (family/class) Voucher</th>
<th>Popular name (dynamic of use)</th>
<th>Complaint (part used) - formula - route of administration</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Abedus</em> sp., <em>Belostoma</em> sp. or <em>Diplonychus</em> sp. (<em>Belostomatidae/Insecta)</em></td>
<td><em>Water cockroach (barata d’água)</em></td>
<td>Bronchitis and asthma (whole animal) - powder - ingested</td>
</tr>
<tr>
<td><em>(Family)</em> <em>L. (Formicidae/Insecta) Voucher</em></td>
<td><em>Ant (formiga)</em></td>
<td>Epilepsy (ant hill) - in natura - ingested</td>
</tr>
<tr>
<td><em>(Family)</em> *Sn. or <em>Bothrops</em> sp. (<em>Viperidae/Reptilia)</em></td>
<td><em>Snake (cobra)</em></td>
<td>Bronchitis (skin) - powder - ingested</td>
</tr>
<tr>
<td><em>(Family)</em> <em>Crocodileus</em> sp., <em>Caiman</em> sp. or <em>Paleosuchus</em> sp. (<em>Alligatoridae/Reptilia)</em></td>
<td><em>Alligator (jacaré)</em></td>
<td>Apoplexy (skin) - syrup of skin powder - ingested</td>
</tr>
<tr>
<td><em>Bronchitis (bone) - powder - ingested</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>(Family)</em> <em>Crotalus</em> cf. <em>durissus</em> L. (<em>Viperidae/Reptilia)</em></td>
<td><em>Rattlesnake (cascavel)</em></td>
<td>Back pain (fat) - in natura - ingested</td>
</tr>
<tr>
<td><em>Bronchitis (rattle) - tie it in the neck - topic</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Bronchitis (bone) - powder - ingested</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>(Family)</em> <em>Geochelone</em> sp. (<em>Testudinidae/Reptilia)</em></td>
<td><em>Turtle (tartaruga)</em></td>
<td>Bronchitis and asthma - (turtleshell) - powder - ingested</td>
</tr>
<tr>
<td><em>(Family)</em> <em>Hydrochoerus</em> cf. <em>hydrochaeris</em> L. (<em>Hydrochaeridae/Mammalia)</em></td>
<td><em>Capybara (capivara)</em></td>
<td>Bronchitis and asthma - (skin) - powder - ingested</td>
</tr>
<tr>
<td><em>(Family)</em> <em>Iguana</em> cf. <em>iguana</em> L. (<em>Iguanidae/Reptilia)</em></td>
<td><em>Iguana (iguana)</em></td>
<td>Osteoporosis and rheumatism (bone) - powder - ingested</td>
</tr>
<tr>
<td><em>(Family)</em> <em>Periplaneta</em> americana L. (<em>Blattidae/Insecta)</em></td>
<td><em>Cockroach (barata)</em></td>
<td>Bronchitis and asthma (whole animal) - powder - ingested</td>
</tr>
<tr>
<td><em>(Family)</em> <em>Placosoma</em> sp. (<em>Gymnophthalmidae/Reptilia)</em></td>
<td><em>Lizard (calango)</em></td>
<td>Wounds in the body (skin) - powder - ingested</td>
</tr>
<tr>
<td><em>(Family)</em> <em>Rhinella</em> sp. (<em>Bufonidae/Amphibia)</em></td>
<td><em>Cururu frog (sapocururu)</em></td>
<td>Cancer of skin (whole animal) - in natura: tie it on the cancer for some time each day - topic</td>
</tr>
<tr>
<td><em>(Family)</em> <em>Tolypeutes</em> sp. (<em>Dasypodidae/Mammalia)</em></td>
<td><em>Armadillo-ball (tatubola)</em></td>
<td>Wounds in the body (skin) - powder - ingested</td>
</tr>
</tbody>
</table>

Marked by (°) the two animals whose use had been maintained, while 10, marked by (*) are those whose uses have fallen into disuse. * Animals that couldn’t be collected because were not available in Diadema.

Table 2. The 12 animals indicated by migrant PE2, their popular and scientific names, complaints (part used), formula and route of administration (adapted of Garcia et al., 2010).
The Influence of Displacement by Human Groups Among Regions in the Medicinal Use of Natural Resource: A Case Study in Diadema, São Paulo - Brazil

### Table 3

<table>
<thead>
<tr>
<th>Category of use</th>
<th>Complaints (number of plants cited)</th>
<th>Total number of plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Gastrointestinal disturbances</td>
<td>To combat worms (1), ulcer (1), diarrhoea (1), bellyache (2), heartburn (1), intestinal infections (1), liver pain (3), to improve digestion (1), hemorrhoid (1), as laxative (10) and for stomach purify (2)</td>
<td>24</td>
</tr>
<tr>
<td>2- Inflammatory processes</td>
<td>As anti-inflammatory (3) and healing (6), to treat sty/conjunctivitis (2), inflammation in the mouth/throat (3), rheumatism (2), sinusitis (2) and gingivitis (1)</td>
<td>19</td>
</tr>
<tr>
<td>3- Respiratory problems</td>
<td>To combat cough (1), bronchitis (15) and as expectorant (2)</td>
<td>18</td>
</tr>
<tr>
<td>4- Anxiolytic/hypnotics</td>
<td>As sedative (11)</td>
<td>11</td>
</tr>
<tr>
<td>5-Osteomuscular problems</td>
<td>To ease back pain (1), muscles pain (6), hip pain (1), prevent osteoporosis (1) and to treat lesions in bone (1)</td>
<td>10</td>
</tr>
<tr>
<td>6- Dermatological problems</td>
<td>To combat external allergies (2), wounds in the body (5) and inhibits the growth of skin stains (1)</td>
<td>8</td>
</tr>
<tr>
<td>7- Genitourinary disturbances</td>
<td>As diuretic (5), to combat kidney stone (2) and treating urine with blood (1)</td>
<td>8</td>
</tr>
<tr>
<td>8- Endocrine system</td>
<td>To reduce cholesterol (1) and diabetes (3)</td>
<td>4</td>
</tr>
<tr>
<td>9- Cardiovascular problems</td>
<td>Treat heart problems (1) and as blood purifier (2)</td>
<td>3</td>
</tr>
<tr>
<td>10- Immunological problems</td>
<td>To combat breast cancer (1) and stomach cancer (1)</td>
<td>2</td>
</tr>
<tr>
<td>11- Analgesics</td>
<td>Earache (2)</td>
<td>2</td>
</tr>
<tr>
<td>12- Fever</td>
<td>To combat fever (1)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>110</strong>*</td>
</tr>
</tbody>
</table>

*Some plants have been cited for more than one complaint, so the total number of plants above (110) is higher than the ones indicated by the interviewees.

Table 3. The 12 categories of use comprising the 41 complaints, their total and partial number of plants cited by the five migrants (adapted of Garcia et al., 2010).

dermatological problems (8.3%), analgesics (8.3%), cardiovascular problems (8.3%) as shown in Table 5. The high humidity of the region (with annual rainfall between 1.000 and 1750 mm) (IBAMA, 2011) is known to lead to bronchitis, cough and asthma. This may explain why so many plants and animals were used to treat respiratory disturbances in Diadema, which has been shown in studies of the Sistema Único de Saúde (2011) to be the second largest cause of death in Diadema - 14.4%. Many animals have been used for medical
purposes since antiquity (Antonio, 1994; Conconi & Pino, 1988; Gudger, 1925; Weiss, 1947). Despite the existence of several ethnopharmacological studies suggesting the bioactive potential of Brazilian fauna (Alves & Delima, 2006; Alves & Dias, 2010; Alves & Rosa, 2005; Costa-Neto, 2002, 2006; Hanazaki et al., 2009; Rodrigues, 2006), only marine animals have been investigated by chemical and pharmacological methods (Berlink et al., 2004; Gray, 2006; Kossuga, 2009). No pharmacological data was found in the literature for the five animals identified in the present study: rattlesnake (*Crotalus cf. durissus* L.), capybara (*Hydrochoerus cf. hydrochaeris* L.), iguana (*Iguana cf. iguana* L.), ant (*Atta sexdens*) and cockroach (*Periplaneta americana*). The lack of information available on medicinal animal products leads us to conclude that this is a largely unexplored topic in Brazil and that future pharmacological studies should confirm the potential therapeutic value of these species.

<table>
<thead>
<tr>
<th>SN</th>
<th>Category of use</th>
<th>Plant specimen</th>
<th>% All Species</th>
<th>Use citation</th>
<th>% All use citation</th>
<th>Fic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gastrointestinal disturbances</td>
<td>24</td>
<td>30.77</td>
<td>44</td>
<td>25.29</td>
<td>0.46</td>
</tr>
<tr>
<td>2</td>
<td>Inflammatory processes</td>
<td>19</td>
<td>24.36</td>
<td>28</td>
<td>16.09</td>
<td>0.33</td>
</tr>
<tr>
<td>3</td>
<td>Respiratory problems</td>
<td>18</td>
<td>23.07</td>
<td>31</td>
<td>17.82</td>
<td>0.43</td>
</tr>
<tr>
<td>4</td>
<td>Anxiolytic/hypnotics</td>
<td>11</td>
<td>14.10</td>
<td>19</td>
<td>10.92</td>
<td>0.44</td>
</tr>
<tr>
<td>5</td>
<td>Osteomuscular problems</td>
<td>10</td>
<td>12.82</td>
<td>13</td>
<td>7.47</td>
<td>0.25</td>
</tr>
<tr>
<td>6</td>
<td>Dermatological problems</td>
<td>8</td>
<td>10.26</td>
<td>11</td>
<td>6.32</td>
<td>0.3</td>
</tr>
<tr>
<td>7</td>
<td>Genitourinary disturbances</td>
<td>8</td>
<td>10.26</td>
<td>13</td>
<td>7.47</td>
<td>0.41</td>
</tr>
<tr>
<td>8</td>
<td>Endocrine system</td>
<td>4</td>
<td>5.13</td>
<td>5</td>
<td>2.87</td>
<td>0.25</td>
</tr>
<tr>
<td>9</td>
<td>Immunological problems</td>
<td>2</td>
<td>2.56</td>
<td>4</td>
<td>2.30</td>
<td>0.66</td>
</tr>
<tr>
<td>10</td>
<td>Cardiovascular problems</td>
<td>3</td>
<td>3.84</td>
<td>3</td>
<td>1.72</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Analgesics</td>
<td>2</td>
<td>2.56</td>
<td>2</td>
<td>1.15</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>Fever</td>
<td>1</td>
<td>1.28</td>
<td>1</td>
<td>0.57</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4. Values of Informant consensus factor (Fic) for each category of use, considering the plants cited by the five Diadema’s migrants (adapted of Garcia et al., 2010).

<table>
<thead>
<tr>
<th>Category of use</th>
<th>Complaints (number of animals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Respiratory problems</td>
<td>bronchitis (7), asthma (4)</td>
</tr>
<tr>
<td>2-Central nervous system</td>
<td>epilepsy (1)</td>
</tr>
<tr>
<td>3-Inflammatory processes</td>
<td>rheumatism (1)</td>
</tr>
<tr>
<td>4-Dermatological problems</td>
<td>wounds in the body (1), skin cancer (1)</td>
</tr>
<tr>
<td>5-Analgesics</td>
<td>back pain (1)</td>
</tr>
<tr>
<td>6-Cardiovascular problems</td>
<td>treat heart problems (1), hemorrhage (1)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong>*</td>
</tr>
</tbody>
</table>

* some animals have been cited for more than one complaint, so their total number above (18) is higher than the number of animals indicated: 12.

Table 5. The 6 categories of use comprising the 9 complaints, their respective number of animals mentioned by the migrant PE2 (adapted of Garcia et al., 2010).
5. Conclusion

The ethnobotanical/ethnopharmacological survey among migrants becomes important in that it rescues the knowledge and values that are rapidly disappearing with the death of older migrants and destruction of biomes around the world (Ososki et al. 2007; Reyes-Garcia et al. 2005).

The studies that rescue a large number of uses for different categories (for example: gastrointestinal disorders, inflammation, fever and others), can expand several lines of pharmacological and phytochemical investigations. In addition, it may be more important for the development of new drugs with large pharmacological/phytochemical effects and safer, as well some therapeutic uses mentioned by the migrants were confirmed by previous studies in the literature.

The study of case in Diadema (São Paulo – Brazil) the migrant interviewees demonstrated a large knowledge about the toxic and medicinal properties of some plants and animals. Migration contributed to increase of knowledge regarding the use of natural resources, mainly through the processes of incorporation and/or resource replacement.

The seven plants [Impatiens hawkeri W. Bull., Artemisia canphorata Vill., Zea mays L., Equisetum arvensis L., Senna pendula (Humb. & Bonpl. ex Willd.) H.S. Irwin & Barneby, Fevilloa passiflora Vell. and Croton fuscescens Spreng] showed maintenance of use among migrants and have not been studied by pharmacologists yet. These species should be highlighted in further investigations because the maintenance of use during human migrations can be indicative of bioactive potential.

The interviewed migrants had passed through several Brazilian cities and were exposed to distinct vegetation and cultures. In this migration, they have passed on and incorporated knowledge in an intensive exchange where formulas and uses are mixed and re-invented as a result of contact between cultures.

This chapter is an attempt to demonstrate based on some scientific papers, the importance of the field (ethnobotanical/ethnopharmacological) in search of new bioactive molecules and how the information about the use of natural resources for health promotion may be more diverse and enriched when human groups displace among regions. We hope this text can assist as a basis for future multidisciplinary research to development new drugs.

6. Acknowledgment

We thank the interviewees for their hospitality, help, and mainly for providing us with information for the purpose of this study in the city of Diadema – São Paulo - Brazil. We are grateful to Julino Assunção Rodrigues Soares Neto and Valéria Basti. We also appreciate the help of FAPESP (Fundação de Amparo à Pesquisa do Estado de São Paulo), FIC (Faculdade Integral Cantareira), AFIP (Associação Fundo de Incentivo à Psicofarmacologia), FUNDUNESP (Fundação para o Desenvolvimento da UNESP) and Herbário Municipal de São Paulo (PMSP), which provided financial support which made this research possible. We thank Dr. Lúcia Rossi and Prof. Dr. Hussam El Dine Zaher, for conducting the botanical and animal identification, respectively. Finally, we really like to thank Prof. Eliana Rodrigues and Prof. Marcus Vinicius Domingues for their participation and orientation.
7. References


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The Influence of Displacement by Human Groups Among Regions in the Medicinal Use of Natural Resource: A Case Study in Diadema, São Paulo - Brazil


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The history of pharmacology travels together to history of scientific method and the latest frontiers of pharmacology open a new world in the search of drugs. New technologies and continuing progress in the field of pharmacology has also changed radically the way of designing a new drug. In fact, modern drug discovery is based on deep knowledge of the disease and of both cellular and molecular mechanisms involved in its development. The purpose of this book was to give a new idea from the beginning of the pharmacology, starting from pharmacodynamic and reaching the new field of pharmacogenetic and ethnopharmacology.

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