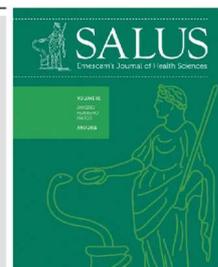




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REVIEW

Ethnobotany and ethnopharmacology: traditional medicine and the bioprospection of phytotherapics

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Abstract

Objective: To demonstrate the importance of Ethnobotany and Ethnopharmacology, as traditional practices and bioprospecting of Herbal Medicine for the Health System. **Methods:** This is a bibliographic database in information sources, using descriptors such as search strategy. **Results:** Ethnobotany and Ethnopharmacology represent strategies to the rescue of scientific and technological knowledge toward the sustainable use of medicinal plants. **Conclusion:** The inclusion of herbal medicine in primary care in the Unified Health System, qualifies access, strengthening the implementation of public policies on health.

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Introduction

Brazil has great potential for the development of phytotherapies, since it holds the world's greatest vegetal and social diversity. The use of medicinal plants was linked to traditional popular knowledge and to technology foresight¹⁻³, in order to scientifically validate such knowledge. The use of these plants means producing and reproducing knowledge

fields and practices originated from different cultures and from the social and productive organization within traditional communities. The use of plant species in order to treat and cure diseases was perpetuated throughout the history of civilization. As for the importance given by primitive men to plants, sorcerers were considered to be Gods' intermediaries with men; they had the task of healing sicknesses. There practices linked

magic, religion and empirical health practices such as the use of medicinal plants⁴⁻⁶, which were seen as therapeutic resource in many communities and ethnic groups^{6,7}. Popular observations and scientific investigations on the use and the effectiveness of medicinal plants from all over the world highlight the practice of consuming phytotherapeutic products and it validates the information gathered over the centuries⁷⁻⁹.

Ethnobotany and Ethnopharmacology are considered to be important tools to rescue the traditional knowledge from past and present human societies, and their ecological, genetic, evolutionary, symbolic and cultural interactions with plants as well as with the development of the scientific and technological knowledge on the sustainable use of natural resources^{10,11}.

Brazil has faced many advances over the last decades regarding phytotherapy regulation and its acceptance as a therapeutic strategy available in the Primary Healthcare System (SUS – Sistema Único de Saúde). The formulation and implementation of public policies to support the enhancement of knowledge on traditional and scientific medicinal plants and on their use in the primary healthcare by the Public Healthcare System represents the regulatory framework and the incentive towards research on medicinal plants and phytotherapy. These policies prioritize biodiversity, technology development and innovations in different supply chain stages countrywide. Such fact led to the current revision study, since it aims to demonstrate the importance of Ethnobotany and Ethnopharmacology to the rescue of traditional practices and the Phytotherapy technological forecasting within the Primary Healthcare System (SUS – Sistema Único de Saúde).

Methods

A bibliographical survey of journal articles, theses and national dissertations was indexed in the following electronic databases: PubMed, Scopus, Web of Science, SciELO, Lilacs, Capes Thesis Portal and government websites (for relevant research on legislation regarding medicinal plants and

phytotherapy), from Jan/1983 to Dec/2014. Keyword combinations and descriptors were used as search strategy: Ethnobotany and Ethnopharmacology; traditional knowledge and technological foresight; Phytotherapy.

Medicinal Plants and Traditional Knowledge

According to the World Health Organization (WHO) big part of the world's population trust in traditional methods related to daily healthcare. Approximately 80% of the population, mainly in the developing countries, relies on medicinal plant derivatives for its own healthcare. Approximately 25% of all medication prescriptions are formulations based on substances derived from plants or synthetic analogues or on their derivatives^{13,14}.

These medicine's potentials are widely valued by the traditional population – regardless of the cultural aspects and the shared benefits resulting from such knowledge^{13,15}. Numerous processes marked the art of healing through medicinal plants. However it is difficult to precisely delimit them, since, for a very long time, they have been associated to magical, mystical and ritualistic practices, fact that gave them vital importance in the traditional medicine^{11,14,15}. Women were in charge of extracting plants' active principles to be used in healing diseases in Brazilian tribes.

As individuals become able to fulfill their survival needs, they start setting up specific social roles to community members^{11,13}. The main role was played by the "healer", who had to zealously develop and keep a repertoire of secret substances and selectively transmit such knowledge to well-prepared beginners^{15,16, 17}.

A series of cultural influences such as that from European, Indigenous and African colonizers led to popular knowledge. These influences were usually developed by cultural groups that intimately live in contact with nature and observe it closely on daily basis. These groups explore the potential of and keep the inherited knowledge alive due to systematic and constant experimentation. They believe that these plants are a feasible alternative for treating diseases or for health

maintenance^{11,18,19}. Oral transmission is the only way to keep such knowledge; it deals with the direct contact between youngsters and the elderly within a certain community; such fact demands intense and long family contact throughout generations^{10,11}.

Brazil was essentially rural up to the mid-twentieth century and presented extensive use of medicinal flora, both native and introduced^{20,21}. However, in many of its locations, where modernization had been more forcefully introduced, the familiarity with medicinal flora no longer exists, due to changes on the acceptance of traditional values by youngsters who started seeing the popular knowledge as old-fashioned and derogatory^{10,11}. Industrialization onset and the increasing urbanization put the traditional knowledge in second place because of external economic and cultural pressures^{20,21}. There were also changes in life, values and logic concepts during the socialization process. Such changes were associated with social transformations and, as a consequence, they devalued such traditional practices.^{15,21} Traditional knowledge was lost over time, since individuals left no written records of them. New social habits always prioritize foreign information and ease access to modern medicine services. Thus, new social habits lead to the displacement of local residents from their natural environments to urban areas^{11,15}.

During the second half of the twentieth century, the environmental issues gained ground in international panels. However, a strong insurgency process involving other actors struggled for "nature defense" or "sustainable development"; it came along with the popularization of the environmentalist movement. The undertaken political efforts still fail to satisfactorily respond to the current conflicts in everyday life^{1,8,21}. As the capitalist model and all forms of materialization have dominated almost the entire globe^{21,22}, populations living traditionally (indigenous, *quilombolas*, rural communities and the periphery communities in urban centers) were left at the margins of development^{11,15, 22}. Moreover, for quite a long time, traditional medicine

representations were considered to be exotic objects deprived of coherence and efficiency. They featured delayed societies and cultures sentenced to disappear due to the implementation and dissemination of the Western Medicine^{21,23}, prior to these practices' different manifestations performed by healers and plant "specialists"^{6,7}.

As they live in contact with the environment, farmers and Brazilian traditional communities incorporated forest landscape elements in its production routine as a survival strategy to get different resources for their own family consumption, to meet their productive activity needs and to seasonally or occasionally have an second income throughout the year^{4,10}. The regional use of native resources is strongly associated to local communities, small farms, *caçaras*, *quilombolas* and indigenous communities²⁵. They use these resources for energy purposes (firewood), for seasonal fruit and plants consumption, for ornamental and for medicinal purposes^{24,25}. Due to the availability of raw materials, medicinal plants are usually grown in gardens, backyards or collected in the woods, as the ancestors used to do^{20,25}. The precariousness of conventional medical care made plants the only resource of disease treatment available in most of the cases^{11,25}.

Knowledge in traditional communities often appears linked to its practicality. Thus, knowledge interconnects experiences and has real interference on community environment; most of the time it is the emergence source of new knowledge^{11,16}. Awareness usually has some purpose and leads to practical results. There is no discrimination between theoretical and practical knowledge in these communities as both are acquired at the same time. Children participate in daily tasks, gradually absorb verbal explanations and codify them through their own doings^{10,11,16}. These communities, in most cases, are family groups that hold their own knowledge and transfer it through generations, i.e., they transfer their features, culture and the way they deal with healthcare within their own group^{15,16,23}. Such type of family contact is very common in rural communities where family agriculture is

effective and daily contact among generations is valued. They do not transfer just the aspects related to the sustainable production system, but also those associated to beliefs, values and the cultural environment^{15,25}.

The awareness about the way different societies deal with the surrounding environment plays a fundamental role in the access to socialized traditional knowledge in the extent that such awareness is recorded and systematized as an attempt to rescue the popular knowledge^{21,25,27}. Surveys on this matter have been relevant and they come in addition to the reflection on the human relationship with the environment in a given time and place. Such surveys may support forest management plans^{27,28} in order to achieve biodiversity conservation and to make these type of knowledge accessible to future generations and to further studies^{28,29}. All the elements subjected to study are important to clarify concepts and practices related to health and disease healing in a certain community^{22,23}. The Ethnobotany and Ethnopharmacology of traditional medicinal plants are important tools to ensure "knowledge" rescue by taking under account its traditional scientific applicability^{23,26}. These two scientific fields seek a plant list^{15,22} to help the research on bioactive substances and to clarify the constitutive and characteristic elements (material or symbolic) and concepts of local therapeutic practices^{22,26}

Ethnobotanical and Ethnopharmacological Approach

The term "Ethnobotany" was created in 1895 by the botanical taxonomist John W. Harshberger, from Pennsylvania University (30). Ethnobotany is a very old discipline, since knowledge about useful plants dates back to the existence of humankind itself.³¹ It is the study of the human past and present societies, their ecological, genetic, evolutionary, symbolic and cultural interactions with plants.^{30,31} The ethnobotanical investigation can play major roles such as gathering information concerning all possible plant uses,

contributing to the development of new ways of ecosystem exploitation and opposing to the current destructive forms^{32,33}. Traditional knowledge and Technologies - enriched by the western scientific knowledge - can be developed within regional programs. It must be understood not just as a new rational development style - in ecological terms -, but as part of a political strategy for social exchange.^{22,34,35}

The development of natural sciences and Anthropology in Brazil led to a new perspective in plant studies and to the use of medicinal plants by different human groups.^{30,31} Ethnobotanical studies indicate that people affect the structure of plant communities and landscapes as well as the evolution of individual species and the biology of certain plant populations of interest. The intervention is not always negative, as it is commonly credited to human intervention, but it can be beneficial and promote manageable resources.^{31,33,36} Such studies – whenever they are developed in rural communities that occupy high biodiversity areas,²⁸ can provide important data on medicinal plants, food and other items and it expands the potential use of resources associated to biodiversity conservation.^{28,29,36}

Ethnobotany dealt with limited characters in its beginning. It just studied the interrelation between plants and "primitive" societies.³⁴ Its investigation focus had grown over time and nowadays integrates not only indigenous communities, but also other traditional and industrial societies and their relationships with the flora.^{12,18} With regards to ethnobotanic investigations, plant classifications must have in mind several social practices such as land cultivation and food, medication and cosmetics used for disease treating.^{32,37}

Researches in this field help determining appropriate practices of vegetation management as they employ acquired traditional knowledge to solve community problems as well to conservation purposes.^{3,38} They may also support studies on the sustainable use of biodiversity by valuing and using the empirical knowledge of human societies, since defining traditional

systems means encouraging the generation of scientific and technological knowledge on the sustainable use of medicinal and phytotherapeutic plants.^{2, 21,22} The expression “traditional system” does not mean that it is a static system neither a form of unresponsive cultural backwardness nor that it goes against rationality and modernity.²¹

The coexistence of several health systems worldwide and their use by different social classes is substantial evidence that this interaction is essentially dynamic and leads to changes in all the coexisting systems.²² The ethnopharmacological strategy is absolutely essential to understand the concepts of the system in which information is obtained at, since non-contextualized observations are scientifically useless.^{19,22} Ethnobotanical and ethnopharmacological studies are important, once Brazil holds one of the globe’s richest flora, out of which 99.6% is chemically unknown²⁸. Intensified studies lead to knowledge on the properties of new species that are already in use. Such species may become instruments to draw therapeutic use strategies and to preserve native species and their potentialities.^{19,22} Domestication, biotechnological production studies and the genetic enhancement of medicinal plants may promote advantages,^{34,35} since such procedures enable achieving uniformity and high quality materials that are fundamental to research effectiveness and safety.^{26,39} However, scientific research still aims to validate the use of medicinal and phytotherapeutic plants.^{13,14} Therefore, the traditional use can be viewed as the pre-screening of therapeutic properties; such fact does not imply admitting that medicinal plants nor homemade remedies are deprived of toxicity. The scientific investigation called ethnopharmacological method aims to formulate hypotheses about active substances responsible for already reported therapeutic actions.^{18,19,22}

The ethnopharmacological approach is a strategy for medicinal plant research and it consists on combining information acquired from medicinal flora users (communities and traditional “specialists”) and on chemical/pharmacological studies^{19,22} conducted in specialized laboratories as well

as on medicinal and phytotherapeutic plant research and on development programs. The isolation of plants’ special metabolites is a research study able to highlight relevant products to pharmacology, chemotaxonomy and to agriculture, particularly those used in food safety.^{19,22 41} Brazil hosts approximately 55.000 plant species presenting pharmacotherapeutic potential.^{3,13} Despite the diversity of existing species, the potential use of plants as new medicine source is still underexplored. Among the estimated 250.000-500.000 plant species in the world, only a small percentage of them have been phytochemically investigated.^{13,22} Such fact also concerns pharmacological properties, which, in most cases, just hold preliminary studies.^{13,22,42} Addressing medicinal plants used by oral tradition societies may be useful to the development of pharmacological, phytochemical and agronomic studies. Such use avoids economic and time losses and demonstrates that it is possible to plan a research by taking medicinal plants and the knowledge about them into consideration.^{10,11,42}

Traditional medicine often seeks to restore balance by using chemically complex plants or by mixing several different plants; it maximizes a synergistic effect or improves the probability of interaction with an important molecular target³. This type of treatment has extremely importance in developing countries where medicinal plants are widely used in the Primary Healthcare Units (APS - Atenção Primária à Saúde).^{1,13}

The importance of Phytotherapy in the Brazilian National Health System (SUS – Sistema Único de Saúde)

Historically, medicinal plants are important phytotherapeutics and help the findings on new medicines; most medical contribution come from the vegetable kingdom.^{19,22} The term “phytotherapy” is given to treatments using plants or their derivatives as active component. These treatments result from popular knowledge and use plants traditionally called “medicinal plants”.⁴⁴

The use of phytotherapeutics with prophylactic, curative, palliative or diagnostic purposes

became officially recognized by the World Health Organization (WHO) in 1978, when it recommended the worldwide dissemination of the necessary knowledge for its use.^{8,9} By considering the medicinal plants as important Pharmaceutical Care instruments^{1,2}, it is possible stating that many WHO announcements and resolutions express the organization's position on the need to value the use of these medications within the sanitary scope. It also recommends that national regulation policies, regarding products derived from traditional practices, must follow the Traditional Medicine (TM) concepts and the Complementary/Alternative Medicine (CAM), among others.^{1,2,45}

Products and services offered by the National Health Care System (SUS - Sistema único de Saúde) such as medicinal plants and phytotherapy programs follow different procedures, since the available medicinal plant species are distributed (in all Brazilian regions) according to different biomes.^{8,9} Studies about phytotherapy programs and actions show that phytotherapy and medicinal plants inclusion in primary healthcare units has improved the access to other therapeutic possibilities, besides the synthetic drugs. It strengthens the implementation of public policies, the local development and the rescuing of traditional knowledge based populations.^{9,43} Such inclusion encourages health professionals to organize health and environmental educational activities and to take intersectoral actions (agricultural, educational and environmental partnerships).^{8,9,43}

Currently, the main instruments used to guide the development of actions/programs involving medicinal plants and phytotherapy are: the National Policy on Integrative and Complementary Practices of the National Healthcare System (PNPIC-SUS – Política Nacional de Práticas integrativas e Complementares do Sistema Único de Saúde) and its guidelines regarding Medicinal Plants and Phytotherapy in the National Health Care System (SUS - Sistema único de Saúde)”; the "National Policy of Medicinal Plants and Phytotherapics" (PNPMF - Política Nacional

de Plantas Mediciniais e Fitoterápicos).¹⁻³ These actions/programs cover the development and adaptation of regulatory marks and encourage the research on medicinal plants. They prioritize biodiversity in the country and the development of technologies and innovations in different stages of the production chain.^{8,9}

The National Program for Medicinal Plants and phytotherapics (PNPMF - Programa Nacional de Plantas Mediciniais e Fitoterápicas) encourages researches involving adapted exotic or native plants included in the Brazilian National List of Phytotherapics (RENAFITO - Relação Nacional de Plantas Mediciniais e Fitoterápicos). This list is subsidized by studies and research on product development and innovation, mainly in the agro-industrial sector². RENAFITO inclusion criteria are: i) to be a Brazilian flora species out of extinction risk; ii) to be found in several Brazilian biomes; iii) to evidence safety and efficacy; iv) to be recorded in the Brazilian National Health Surveillance Agency (ANVISA-Agência Nacional de Vigilância Sanitária); v) to be a phytotherapeutic used in primary care vi) to be produced with native or adapted exotic plants.¹⁻³

The Brazilian Ministry of Health (Ministério da Saúde-MS) published the Brazilian National List of Medicinal Plants of Interest to the Healthcare System (RENISUS - Relação Nacional de Plantas Mediciniais de Interesse ao SUS)² in February 2009, in order to strengthen the research on native medicinal plants and make this information available. The list consists of 71 plant species the research; investment on them are prioritized as well as their safe and effective use in different presentation forms: *in natura* vegetal material, dried plant, and pharmacy-compounded and manufactured drugs.²⁻³ Safety and efficacy proof is performed according to the traditional use listed in the literature or in scientific studies about these plant species.³

Differently from what one may think, Phytotherapy is a complementary healthcare practice, although it is one of the most known and used in the Brazilian public services. The growing number of healthcare professionals willing to be trained in such area was noticed

in some Brazilian counties, since they all aspire to daily improve their work in the healthcare field and it acquires new tools.⁴⁶ The expansion of the “Family Health Strategy”(FHS) – a primary care structural movement in SUS (National Health System) - opened important workspace for Phytotherapy.^{1,43,46} The program developed principles to be applied to this level of attention. Phytotherapy particular features involve the interaction among knowledge, healthcare partnerships, and promotion and prevention actions in primary care (PC).^{8,9} Phytotherapeutic actions strengthen the bond among users, community and teams of the FHS Program, as well as among popular participation, user’s autonomy and healthcare systems.^{8,43} Therefore, the expansion on the coverage of Primary Care in different regions and biomes indicates the potential for the development of medicinal plants and the adoption of phytotherapeutic actions in public health services where phytotherapy can be offered.^{8,9,43} Most herbal medicines used in Germany, besides those used for self-medication, are prescribed by family doctors due to clinical conditions that impair complete diagnosis (50% of the cases) in the office. Such fact encourages medical professionals to value other clinical work elements such as the patient’s lifestyle, the need for suffering relief, the less possible harm in terms of adverse reactions and side effects - especially among elderly.⁴⁷ As for the aforementioned situation, in Germany the professional often uses phytotherapy and the same expectation is growing in Brazil.^{43,46} Therefore, the access that the population has to phytotherapy practices and benefits in primary care becomes a fertile ground for the development of its potential within a multiprofessional field; therefore, it also opens a wide range of possibilities and advantages. The closeness between healthcare professionals and the community is an attempt to set a more horizontal relationship between them and it reinforces the role played by the primary care services - the first contact users have with SUS. The expansion on healthcare offering leads to the principle of health integrity.^{8,9}

Final Considerations

Ethnobotany and Ethnopharmacology are important tools to rescue traditional knowledge and its scientific applicability, since they combine information acquired from medicinal flora users (communities and traditional “specialists”) through chemical and pharmacological studies. These scientific fields become extremely importance when many of the herein mentioned studies reported that traditional knowledge is being lost over time, either due to the death of individuals who did not leave any written records or due to the introduction of new habits in modern societies. Studies on phytotherapeutic programs and actions show that phytotherapeutic and medicinal plants inclusion in primary healthcare improved the access to other therapeutic possibilities, besides the synthetic drugs. These studies have strengthened the implementation of public policies and the local development. They also rescued the traditional knowledge from old communities, thus helping to spread the scientific research and the development of a critical view from professionals and from the population about the proper use of medicinal plants and phytotherapeutics.

References

1. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Política Nacional de Práticas Integrativas e Complementares no SUS, PNPIC, SUS. (Série B. Textos Básicos de Saúde) Brasília (DF), 2006.
2. Ministério da Saúde. Secretaria de Ciência, Tecnológica e Insumos Estratégicos. Departamento de Assistência Farmacêutica e Insumos Estratégicos Programa Nacional de Plantas Medicinal e Fitoterápicos. Brasília (DF), 2009.
3. Sales MDC. Avaliação e caracterização de insumos bioativos da aroeira (*Schinus terebinthifolius* Raddi) com potencial econômico para o desenvolvimento tecnológico de bioprodutos [Tese de Doutorado]. Vitória (ES): Programa de Pós-Graduação em Biotecnologia, Universidade Federal do Espírito Santo (UFES), 2013.

4. Alvim NAT, Ferreira, MA, Cabral, IE, Filho Almeida, AJ. O uso de plantas medicinais como recurso terapêutico: das influências da formação profissional às implicações éticas e legais de sua aplicabilidade como extensão da prática de cuidar realizada pela enfermeira. *Rev Latino-am Enfermagem*. 2006; 14(3): 316-23.
5. Calixto, JB. Twenty-five years of research on medicinal plants in Latin America: a personal view. *J. Ethnopharmacol*. 2005; 100 (1-2): 131-4.
6. Maciel MAM, Pinto AC, Veiga Jr. VF, Grynberg NF, Echevarria A. Plantas medicinais: a necessidade de estudos multidisciplinares. *Quím Nova*. 2002; 25(3): 429-38.
7. Albuquerque UP, Lucena RFP. Métodos e técnicas na pesquisa etnobotânica. Recife: Livro Rápido / NUPPEA, 2004.
8. Rodrigues AG, Amaral ACF. Aspectos sobre o desenvolvimento da fitoterapia. In: Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Práticas integrativas e complementares: plantas medicinais e fitoterapia na Atenção Básica. Brasília: Ministério da Saúde, 2012. p.13-16.
9. Antonio GD, Tesser CD, Moretti-Pires RO. Fitoterapia na atenção primária à saúde. *Rev Saúde Pública*. 2014; 48(3): 541-53.
10. Amorozo MC de M. A abordagem etnobotânica na pesquisa de plantas medicinais. In: Di Stasi LC (Org.). Plantas medicinais: arte e ciência. Um guia de estudo interdisciplinar. São Paulo: UNESP; 1996. p. 47-68.
11. Amorozo MCM. Uso e diversidade de plantas medicinais em Santo Antônio do Laverger, MT, Brasil. *Acta Bot Bras*. 2002; 16 (2): 189-203.
12. Albuquerque UP de. Etnobiologia e Biodiversidade. Recife: NUPEEA/ Sociedade de Etnobiologia e Etnoecologia, 2005.
13. Gurib- Fakim A. Medicinal plants: traditions of yesterday. *Mol Aspects Med*. 2006; 27: 1-93.
14. Martins ER, Castro DM de, Castellani DC, Dias JE. Plantas Medicinais. Viçosa: UFV, 2000.
15. Coutinho DF, Travassos LMA, Amaral, FMM do. Estudo etnobotânico de plantas medicinais utilizadas em comunidades indígenas no estado do Maranhão - Brasil. *Visão Acadêmica*. 2002; 3(1): 7-12.
16. Savastano MAP, Di Stasi LC. Folclore: conceitos e metodologia. In: Di Stasi LC (org.). Plantas medicinais: Arte e Ciência. Um guia de estudo interdisciplinar. São Paulo: EDUSP, 1996. p. 37-45.
17. Simões, CMO, Schenkel EP; Simon D. O guia decepar chora de ervas: 40 receitas naturais para sua saúde perfeita. Rio de Janeiro: Campus, 2001.
18. Elisabetsky E. Etnofarmacologia de algumas tribos brasileiras. In: Ribeiro D. Suma etnológica brasileira. Petrópolis: Vozes; 1997.
19. Elisabetsky E. New directions in ethnopharmacology. *J. Ethnobiol*. 1986; 6(1): 121-8.
20. Lorenzi H, Matos FJA. Plantas Medicinais no Brasil: nativas e exóticas. 2ªed. Nova Odessa: Plantarum, 2008.
21. Luz MT. Cultura contemporânea e medicinas alternativas: novos paradigmas em saúde no fim do século XX. *Physis*. 2005; 15(Supl.): 145-76.
22. Elisabetsky E. Souza GC. Etnofarmacologia como ferramenta na busca de substâncias ativas. In: Simões, CMO, Schenkel EP, Gosmann G, Mello JCP, Mentz LA, Petrovick PR. Farmacognosia, da planta ao medicamento. 6ed. Porto Alegre/Florianópolis: UFRS, 2010. p. 107-22.
23. Buchillet D. Introdução. In: Buchillet D. (org). Medicinas Tradicionais e Medicina Ocidental na Amazônia. Belém: CEJUP, 1991. p. 63-64.
24. Coradin L, Siminski A, Reis A. Espécies nativas da flora brasileira de valor econômico atual ou potencial: plantas para o futuro – Região Sul. Brasília (DF), 2011.
25. Meirelles L. Agricultura ecológica e agricultura familiar. [internet]. Ipê (RS): Centro Ecológico; 2002 [Acesso: 29mar15]. Crise ambiental, revolução verde e a busca de alternativas; [6p]. Disponível em: http://www.centroecologico.org.br/artigo_detalhe.php?id_artigo=10.
26. Calixto JB. Efficacy, safety, quality control, marketing and regulatory guidelines for herbal medicines (phytotherapeutic agents). *Braz J Med Biol Res*. 2000; 33(2): 179-89.

27. Santos S. Um Estudo etnoecológico dos quintais de cidade de Alta Floresta – MT [Dissertação]. Cuiabá (MT): Universidade Federal de Mato Grosso, 2004.
28. Gottlieb OR, Kaplan MAC, Borin MRMB. Biodiversidade. Um enfoque químico-biológico. Rio de Janeiro: Editora UFRJ, 1996.
29. Ming LC, Carvalho I, Vasconcellos MC, Radomski MI, Costa MAG. (Eds.). Direito de recursos tradicionais: formas de proteção e repartição de benefícios. Botucatu: UNESP, 2005. 157p.
30. Albuquerque UP. Introdução à Etnobotânica. Recife: Bagaço, 2002. 87 p.
31. Albuquerque UP de, Andrade L de HC. Conhecimento botânico tradicional e conservação em uma área de Caatinga no Estado de Pernambuco, Nordeste do Brasil. Acta Bot Bras. 2002; 16(3): 273-85.
32. Caballero NJ. Perspectivas para el que hacer etnobotánico en México. In: Barrera A (ed.). La etnobotánica: três puntos de vista y una perspectiva. Xapala: Instituto Nacional de Investigaciones sobre Recursos Bióticos, 1983. p. 25-8.
33. Davis EW. Ethnobotany: an old practice, a new disciplina. In: Schultes RE, Reis S von (Eds.). Ethnobotany: Evolution of a Discipline. New York: Chapman & Hall, 1995. p. 40-9.
34. Martin GJ. Ethnobotany – A method manual. New York: Chapman & Hall, 1995.
35. Di Stasi LC. Plantas medicinais: arte e ciência. Um guia de estudo interdisciplinar. São Paulo: Editora da Universidade Estadual Paulista, 1996. 30p.
36. Bortolotto IM. Etnobotânica nas comunidades do Castelo e Amolar, borda oeste do Pantanal Brasileiro [Tese de Doutorado]. Rio Claro (SP): Instituto de Biociências de Rio Claro, Universidade Estadual Paulista, 2006.
37. Viertler RB. Métodos antropológicos como ferramentas para estudos em etnobiologia e etnoecologia. In: Amorozo MCM, Ming LC, Silva SMP da (Orgs.). Métodos de coleta e análise de dados em etnobiologia, etnoecologia e disciplinas correlatas. Rio Claro: UNES, 2002. p.11-29.
38. Beck HT, Ortiz A. Proyecto etnobotánico de la comunidad Awá en el Ecuador. In: Rios, M, Pedersen HB (Eds.). Uso y Manejo de Recursos Vegetales. Memorias del “II Simposio Ecuatoriano de Etnobotánica y Botánica Económica, Quito”, 1997. p. 159-76.
39. Ming LC, Hidalgo Ade F, Silva MAS da, Silva SMP da, Chaves FCM. Espécies Brasileiras com potencial alimentar: uso atual e desafios. In: Cavalcanti TB (Org.). Tópicos atuais em botânicas: Palestras convidadas do 51º Congresso Nacional de Botânica. Brasília: EMBRAPA, 2000. p. 268-73.
40. Pinto EP P, Amorozo MCM; Furlana. Conhecimento popular sobre plantas medicinais em comunidades rurais de mata Atlântica-Itacaré, BA, Brasil. Acta Bot Bras. 2006; 20(4): 751-62.
41. Duarte MR, Toledo MG, Oliveira RB. Diagnóstico morfoanatómico de Aroeira (*Schinus terebenthifolius* Raddi, Anacardiaceae). Visão Acadêmica (Impresso) 2006; 7(2): 1-14.
42. Rates SMK. Plants as source of drugs. Toxicol. 2001; 39: 603-13.
43. Rodrigues AG, Simoni C De, Machado GN. As plantas medicinais e fitoterapia no contexto da atenção básica/Estratégia Saúde da Família. In: Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Práticas integrativas e complementares: plantas medicinais e fitoterapia na Atenção Básica. Brasília: Ministério da Saúde; 2012. p.29-33.
44. De Pasquale. A. Pharmacognosy: oldest modern science. J Ethnopharmacol. 1984; 11 (S.I.): 1-6.
45. WORLD HEALTH ORGANIZATION (WHO). National Policy on Traditional Medicine and Regulation of Herbal Medicines: report of a WHO Global survey. Geneve: WHO; 2005. 156 p.
46. Rodrigues AG, Barreto BB, Nascimento Júnior JM do, Costa KS, Torres, KR, Alves, RMS. Assistência e atenção farmacêutica com plantas medicinais e fitoterapia. In: Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Práticas integrativas e complementares: plantas medicinais e fitoterapia na Atenção Básica. Brasília : Ministério da Saúde, 2012. p. 72-84.
47. Schulz V, Hansel R, Tyler VE. Fitoterapia Racional. São Paulo: Ed. Manole, 2002.