

**Medicinal plants used in the Amazon region: a systematic review**

Plantas medicinais utilizadas na região Amazônica: uma revisão sistemática

Plantas medicinales utilizadas en la región amazónica: una revisión sistemática

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**Abstract**

The Amazon region’s biodiversity is exploited by the local population, commonly for therapeutic purposes. Given this information, the goal of this study was to perform a systematic review on medicinal plants used in this region, listing the name of the species, location found, and its importance for traditional medicine and for local people. For this, a search was performed in the PubMed/Medline and Lilacs databases, using the descriptors medicinal plants, Amazonia or Amazon region, in Portuguese, English, and Spanish. The main findings demonstrate that different species from different botanical families are used by the local population. The main therapeutic outcomes sought out refer to the search for relief or treatment of gastrointestinal, hepatic alterations, fever, kidney stones, pain, infections, and parasites. Thus, it is concluded that the practice of traditional medicine is very common in the Amazon region and is transmitted orally from generation to generation. In this practice, the use of medicinal plants in the form of tea is highlighted, with the species in the form of powder, dried or natural plants. Therefore, it is recommended that the strengthening of pharmacological studies involving local medicinal plants can provide scientific support for popular knowledge.

**Keywords:** Amazonia; Traditional medicine; Folk knowledge; Ethnopharmacology.

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**Resumo**

A região amazônica possui uma grande biodiversidade, esta que é explorada pela população local, comumente, com a finalidade terapêutica. Diante dessas informações, o objetivo deste estudo foi realizar uma revisão sistemática sobre as plantas medicinais utilizadas nessa região, listando os nomes das espécies, o local encontrado e a sua importância para a medicina tradicional e para a população local. Para isso, realizou-se uma busca nos bancos de dados PubMed/Medline e Lilacs, utilizando os descritores plantas medicinais, Amazônia ou região amazônica, nos idiomas português, inglês e espanhol. Os principais achados demonstram que diferentes espécies de variadas famílias botânicas são utilizadas pela população local. Os principais achados são utilizados na forma de chá, estando as especies na forma de pó, plantas secas ou naturais. Logo, recomenda-se o fortalecimento dos estudos farmacológicos envolvendo as plantas medicinais locais pode fornecer respaldo científico para o conhecimento popular.

**Palavras-chave:** Amazônia; Medicina tradicional; Conhecimento popular; Etnofarmacologia.

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**Resumen**

La región amazónica tiene una gran biodiversidad, que es comúnmente explorada por la población local con fines terapéuticos. Ante esta información, el objetivo de este estudio fue realizar un revisión sistemática de las plantas medicinales utilizadas en esta región, enumerando el nombre de la especie, su ubicación encontrada y su importancia para la medicina tradicional y para la población local. Para ello, realizó una búsqueda en las bases de datos PubMed/Medline y Lilacs, utilizando los descritores plantas medicinales, Amazonía o Región Amazonica, en portugués, inglés y español. Los principales hallazgos demuestran que la población local utiliza diferentes especies de diversas familias botánicas. Los principales resultados terapéuticos buscados se refieren a la búsqueda de alivio o tratamiento de trastornos gastrointestinales y hepáticos, fiebre, cálcucos renales, dolores, infecciones y parasitosis. Por tanto, se concluye que la práctica de la medicina tradicional es muy común en la región amazónica y se transmite por vía oral de generación en generación. En esta práctica se destaca el uso de plantas medicinales en forma de té, con las
especies en forma de polvo, plantas secas o naturales. Por lo tanto, se recomienda que el fortalecimiento de los estudios farmacológicos que involucren plantas medicinales locales pueda brindar soporte científico al conocimiento popular.

**Palabras clave:** Amazonia; Medicina tradicional; Saberes populares; Etnofarmacología.

1. **Introduction**

   The Amazon Rainforest is known as the largest forest on Earth and for sheltering the largest river basin in the world. It is distributed by nine countries in South America, with the largest portion in Brazilian lands (67.8%), where it is called Legal Amazon and it comprises the states of Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima and Tocantins (Penna-Filho, 2013).

   In addition to all its territory greatness, the Amazon has nine kinds of vegetation, of which Terra Firme Forest is the most important, since it covers 90% of the Legal Amazon and presents great variation of plant species that were not or are little explored (Braga, 1979; Penna-Filho, 2013), having them a great potential for generating resources, such as those related to the pharmaceutical and medical areas.

   The potential of using medicinal plants as a treatment for diseases, called phytotherapy, is a practice of traditional medicine that has been used since the appearance of the human species (Badke et al., 2011), however, over the years and with the advance of technology, new ways to treat diseases were being developed and the use of medicinal plants became less common. Nevertheless, phytotherapy practice in Brazil has not lost its relevance despite the great incentives of the pharmaceutical industry in the country, due to folk knowledge about medicinal plants (Badke et al., 2011).

   Additionally, with the advancement of Brazilian health models until the arrival of the Unified Health System, it can be understood that medicinal plants and herbal medicines have a lot to add in developing countries, as they are important instruments of pharmaceutical care, since 67% of medicinal plant species in the world originate from developing countries. Since the past, several notices and resolutions of the World Health Organization (WHO) express the organization's position regarding the need to value the use of these drugs, in the health field, being observed as a normative basis for the maintenance of health (Unesco, 2020).

   In 2006, the National Policy on Integrative and Complementary Practices was granted in order to establish guidelines and institutional responsibilities for the implementation/adaptation of actions and services in traditional Chinese medicine/acupuncture, homeopathy, medicinal plants and phytotherapy, in addition to establishing health observatories for social thermalism/crenotherapy and for anthroposophical medicine in the Unified Health System (Brasil, 2012).

   In line with the above, in 2012, the Brazilian Ministry of Health launched the Primary Care Booklet 31, which guides the actions to be performed by the Basic Health Units and their professionals, in addition to making a historical overview of national policies and informing on the norms, guidelines, services and products related to phytotherapy in the Family Health Strategy/Primary Care. The objective of this is to implement new programs, improving the population's access to safe and quality products and services; sensitize and guide managers and health professionals in the formation and implementation of policies, programs, projects and structures that aim to strengthen phytotherapy, with an emphasis on primary care (Brasil, 2012).

   In this context, since the Amazon Rainforest is a rich region with a large number of plants and phytotherapy practice is relevant in Brazil, the goal of this study was to perform a systematic review on medicinal plants used in this region, listing the name of the species, location found, and its importance for traditional medicine and for local people.

2. **Methodology**

   The study is a systematic review of scientific articles on medicinal plants found in the Amazon region, which are used
in folk medicine; and it was made following the recommendation for PRISM reports of systematic reviews and meta-analyses (Moher et al., 2009).

Eligible studies were identified in searches carried out on July 4, 2019, in the PubMed/Medline (National Library of Medicine, Bethesda, MD) and Lilacs (Latin American and Caribbean Literature on health sciences) databases. The keyword combinations used in database searches, covering the Portuguese, Spanish and English languages, used in accomplishment researches were (“Plantas medicinais”) AND (“Amazonia OR região amazonica”), (“Plants medicinal”) AND (“Amazon OR amazon region”) and (“Plantas medicinales”) AND (“Amazon OR región amazónica”). In this research, all items were identified, regardless of study design.

The criteria for inclusion were data about the medicinal plants of the Amazon region, which are used by folk medicine for the treatment of diseases. Additionally, the exclusion criteria used were divided into three categories. First, data with a publication period before 2009. Second, review articles, historical documents, theses, and dissertations, considering only scientific articles. Third, escape from the theme of the present study, as well as data published without location information, locations outside of the Amazon region, lack of scientific names of medicinal plants and data that does not demonstrate the use of medicinal plants by population, with based on reading the title and abstract of the article.

The selected articles were evaluated by the reviewers considering the reading and careful analysis of the full text, by removing those who deliberate the exclusion criteria adopted. Still, the existence of data duplication in the same database and between databases was checked, and each item was counted only once. The information to be removed from articles included in the study were the names of plant species, the reason for its use, and how it was used, according to the Amazon region.

The results were described in a table, listing the characteristics of the botanical family, the plant species, the purpose of the study, the medicinal use, the form of preparation of the medicinal plant, the route of administration, the location found and the authors and year of the articles (Table 1).

3. Results

After the use of the above descriptors in the databases, 311 published articles were identified between January 1, 2009, and the date of search (July 4, 2019), of which 39 were repeated and were counted only once. After deleting them, there were 272 remaining items, of which 36 were not scientific articles. Then, reading the titles and summaries of other 236 articles, to identify which did not fit the criteria for inclusion, data about the medicinal plants of the Amazon region, which are used by folk medicine for the treatment of diseases. After this analysis, 51 items remained. With the reading of the articles in their entirety, there were 13 items left which were included in this review, because the others didn't bring the information about the medicinal plants of the Amazon region, which are used by folk medicine for the treatment of diseases (Figure 1).

The results obtained regarding the botanical family, the main species, the purposes of the studies, the medicinal use, the form of use and the local application of medicinal plants in the Amazon region are listed in Table 1.
Figure 1 - Flowchart for the systematic process of article selection according to the PRISMA model.

Source: Authors.
| Botanical family | Main species | Purpose of the study | Medicinal use | Preparation | Route of administration | Place | Author, year |
|-----------------|-------------|---------------------|--------------|-------------|-------------------------|-------|-------------|
| Fabaceae        | *Erythrina fusca* Loureiro | Studying, recording and disseminating ethno-knowledge | Tumors, inflammation and cancer | Cooked | Oral | Brazil-Colombia-Peru Border | Rengifo-Salgado et al., 2017 |
|                 | *Diplotropis purpurea var. leptophylla* (Kleinhoonte) Amshoff | Studying, recording and disseminating ethno-knowledge | Tonsillitis | Infusion | Oral | Brazil-Colombia-Peru Border | Rengifo-Salgado et al., 2017 |
|                 | *Capafera paupera* (Herzog) Dwyer | Studying, recording and disseminating ethno-knowledge | Gastritis and inflammation | Direct use | Oral and topic | Brazil-Colombia-Peru Border | Rengifo-Salgado et al., 2017 |
|                 | *Campsianandra angustifolia* Spruce ex Bentham | Studying, recording and disseminating ethno-knowledge | Diarrhea, “belly” pain, liver and rheumatism | Cooked | Oral | Fronteira Brasil-Colombia-Perú | Rengifo-Salgado et al., 2017 |
|                 | *Vigna unguiculata* (L.) Walpers | Studying, recording and disseminating ethno-knowledge | Diuretic and laxative | Cooked | Oral | Fronteira Brasil-Colombia-Perú | Rengifo-Salgado et al., 2017 |
|                 | *Senna alata* (L.) Roxburgh | Studying, recording and disseminating ethno-knowledge | Antibacterial, diarrhea and infections | Infusion | Oral | Fronteira Brasil-Colombia-Perú Santa Isabel do Rio Negro, Brazil | Rengifo-Salgado et al., 2017 |
|                 | *Anadenanthera peregrina* | Seek information from indigenous communities about medicinal plants used as anti-malarials | Malaria | Inhalation | —— | —— | —— | Frausin et al., 2015 |
|                 | *Amburana cearensis* (Fr.Allem.) A.C.Sm. | Describe traditional medicine and analyze plants that can be investigated pharmacologically | Diabetes and anemia | Decoction | Intern use | Porvenir, Bolivia | Hajdu and Hohmann 2012 |
| Arecaceae        | *Dalbergia monetária* L. f | Select species for the treatment of gastrointestinal disorders | Diarrhea | —— | —— | —— | Abaetetuba, Brazil | Gois et al., 2016 |
|                 | *Attalea basslerianna* (Burret) | Studying, recording and | Fractures | Direct use | Topic | Brazil- | Rengifo- |
| Family | Genus | Species | Study Type | Mental State | Preparations | Healing State | Location |
|--------|-------|---------|------------|--------------|--------------|---------------|----------|
| Euphorbiaceae | Iriartea deltoidea | R.&P. | Studying, recording and disseminating ethno-knowledge | | Stomach | Direct use | Oral |
| | Phyllanthus niruri | L. | Studying, recording and disseminating ethno-knowledge | | Fever, kidney and gallstones | Cooked | Oral |
| | Croton lechleri | Muell Arg. | Studying, recording and disseminating ethno-knowledge | | Healing | Direct use | Topic |
| | Jatropha curcas | L. | Studying, recording and disseminating ethno-knowledge | | Alcoholism, fever, gastritis and wounds | Direct use | Oral and topic |
| | Jatropha gossypifolia | L. | Rescuing traditional knowledge about medicinal plants | | "Athlete's foot" and cold | Decoction and bath | Internal and external use |
| | Hura crepitans | L. | Collecting information on plant ethnomedicine in general | | Snake bite and injuries | Decoction, dye, fresh and infusion | Internal and external use |
| Moraceae | Ficus insipida | Wildenow | Studying, recording and disseminating ethno-knowledge | | Hernias | Direct use | Topic |
| | Brosimum guianense | (Aubl) Huber | Studying, recording and disseminating ethno-knowledge | | “Womb” cancer | Cooked | Oral |
| | Ficus guianensis | Desvaux | Studying, recording and disseminating ethno-knowledge | | Rheumatism and fractures | Direct use | Topic |
| Rubiaceae | Genipa americana | L. | Studying, recording and disseminating ethno-knowledge | | Antiparasitic | Infusion | Oral |

Zona diseminating ethno-knowledge

Colombia-Peru Border
Brazil-Colombia-Peru Border
Rengifo-Salgado et al., 2017
| Family         | Species                                      | Activity                                                                 | Condition/Disorder                                      | Preparation | Route       | Location                      | Authors                          |
|----------------|----------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------|-------------|-------------|--------------------------------|----------------------------------|
|                | Faramea anisocalyx Poeppig                   | Collect information on plant ethnomedicine in general                     | Anemia                                                   | Decoction   | Shower      | Paranapur a, Peru              | 19965                            |
|                | Uncaria guianensis (Aublet) Gmelin           | Studying, recording and disseminating ethno-knowledge                     | Gastritis, cancer, prostate, liver and pain              | Cooked      | Oral        | Brazil-Colombia-Peru Border    | Odonne et al., 2013               |
|                | Uncaria tomentosa D.C.                       | Recognize the plants used to treat women’s illnesses                      | Contraceptive                                            | Decoction   | Intern use  | Colombia and Puerto Nariño, Brazil | Rengifo-Salgado et al., 2017     |
|                | Calycophyllum spruceanum (Benth.) K.Schum.   | Recognize the plants used to treat women’s illnesses                      | Vaginal pains                                            | Decoction   | Oral        | Brazil- Colombia- Peru Border   | 2015                            |
| Annonaceae     | Unonopsis spectabilis Diels                  | Studying, recording and disseminating ethno-knowledge                     | Gastritis                                                | Infusion    | Oral        | Brazil-Colombia-Peru Border    | Rengifo-Salgado et al., 2017     |
| Rhamnaceae     | Ampelozizyphus amazonicus Ducke              | Investigate, rescue and report popular knowledge about medicinal plants   | Malaria, liver and “strengthening the blood”            | Maceration   | Oral        | Manaus, Brazil                | Veiga and Scudeller, 2015         |
| Apocynaceae    | Aspidosperma rigidum Rusby                   | Select plants used to treat malaria and fever                             | Malaria, liver and fever and migraine                    | ------------ | ------------ | Oriximina, Brazil               | Oliveira et al., 2015             |
|                | Geissospermum argenteum Woodson              | Select plants used to treat malaria and fever                             | Malaria, liver and hepatitis                             | ------------ | ------------ | Oriximina, Brazil               | Oliveira et al., 2015             |
|                | Himatanthus sucuuba (Spr. Ex Müll.Arg.) W.  | Select plants used to treat malaria and fever; select species for the treatment of gastrointestinal disorders | Malaria and gastritis                                    | ------------ | ------------ | Oriximina, Brazil and Abaetetuba, Brazil | Oliveira et al., 2015; Gois et al., 2016 |
| Solanaceae     | Physalis angulata L.                         | Document indigenous knowledge about the use of medicinal plants            | Fungi on the skin and cholesterol                        | Juice, infusion and decoction                           | Internal and external use         | Coronel Portillo, Peru           | Polesna et al., 2011             |
|                | Solanum mammosum L.                          | Describe traditional medicine and                                        | Skin fungi, infertility                                  | Decoction and | Internal use | Porvenir,                     | Hajdu and                        |
| Plant Species                      | Use in Medicinal Practices                                                                 | Conditions Treated                  | Preparation | Use | Country          | Source                              |
|-----------------------------------|-------------------------------------------------------------------------------------------|------------------------------------|-------------|-----|------------------|-------------------------------------|
| **Solanum sessiliflorum** Dunal    | Recognize the plants used to treat women’s illnesses                                        | Burns and diabetes                 | Juice, tincture and decoction | Internal and external use | Leticia, Colombia and Puerto Nariño, Brazil | Hohmann 2012                      |
| **Mikania lindleyana** DC.         | Select species for the treatment of gastrointestinal disorders                               | Stomachache                        |             |     | Abaetetub, Gois et al., 2016 |                      |
| **Pluchea sagittalis** (Lam.) Cabrera | Select species for the treatment of gastrointestinal disorders                             | Stomach pain and gastritis         |             |     | Abaetetub, Gois et al., 2016 |                      |
| **Vernonia condensata** Baker.     | Select species for the treatment of gastrointestinal disorders                             | Stomach pain and diarrhea          |             |     | Abaetetub, Gois et al., 2016 |                      |
| Asteraceae                        | Investigate, rescue and report popular knowledge about medicinal plants                    | Liver                              |             |     | Abaetetub, Gois et al., 2016 | Veiga and Scudeller 2015          |
| **Spilanthes acmella** (L.) Murray | Investigate, rescue and report popular knowledge about medicinal plants                  | Stomach, fever and malaria         |             |     | Abaetetub, Gois et al., 2016 | Veiga and Scudeller 2015          |
| **Achyrocline satureioides** D.C.  | Investigate, rescue and report popular knowledge about medicinal plants                  |                                   |             |     | Manaus, Brazil    | Gois et al., 2016                  |
| Lamiaceae                        | Select species for the treatment of gastrointestinal disorders                             | Stomach and “belly” pain           |             |     | Abaetetub, Gois et al., 2016 | Gois et al., 2016                  |
| **Mentha sp.**                    | Select species for the treatment of gastrointestinal disorders                             | Stomachache, diarrhea and colic    |             |     | Abaetetub, Gois et al., 2016 | Gois et al., 2016                  |
| **Hyptis crenata** Pohl ex. Benth  | Select species for the treatment of gastrointestinal disorders                             | Stomachache                        |             |     | Abaetetub, Gois et al., 2016 | Gois et al., 2016                  |
| **Coleus sp.**                    | Select species for the treatment of gastrointestinal disorders                             |                                   |             |     | Abaetetub, Gois et al., 2016 | Gois et al., 2016                  |
| Anacardiaceae                     | Select species for the treatment of gastrointestinal disorders                             | Diabetes, ringworm, diarrhea, gastritis and inflammation | Cooked Juice | Oral and topic | Abaetetub, Gois et al., 2016 | Gois et al., 2016                  |
| **Anacardium occidentale** L.     | Check plants used by traditional medicine                                                | Wound cleaning and diarrhea        | Juice       | Topic | Ilha do Mosquerio, Brazil | Mesquita and Tavares-Mastins 2018  |
| Anacardium humile A.St.-Hil.      | Check plants used by traditional medicine                                                | Inflammation                       | Cooked      | Oral  | Ilha do Mosquerio, Brazil | Mesquita and Tavares-Mastins 2018  |
| Plant Family     | Species                        | PRIMARY ACTION                        | TREATMENT                        | SITE           | Authors                                      |
|-----------------|--------------------------------|---------------------------------------|----------------------------------|----------------|---------------------------------------------|
| **Piperaceae**  | *Peperomia pellucida* (L.) Kunth | Check plants used by traditional medicine | "Earthworms"                      | Oral           | Ilha do Mosqueiro, Brazil                  |
|                 | *Piper alatipetiolatum* Yunck. | Check plants used by traditional medicine | The flu                           | Juice and maceration | Topic | Ilha do Mosqueiro, Brazil                  |
|                 | *Piper peltatum* L.            | Rescuing traditional knowledge about medicinal plants | Hepatitis, anemia and kidney infection | Infusion, decoction | -------- | Rondônia, Brazil                          |
|                 | *Pothomorphe umbellata* (L.)   | Rescuing traditional knowledge about medicinal plants | Hepatitis, malaria and headache | Maceration | -------- | Rondônia, Brazil                          |
|                 | *Ruta graveolens* L.           | Check plants used by traditional medicine | Headache                          | Maceration     | Topic | Ilha do Mosqueiro, Brazil                  |
| **Rutaceae**    | *Citrus reticulata*            | Describe traditional medicine and analyze plants that can be investigated pharmacologically | Eyes and stomach pain | Infusion | Intern use | Porvenir, Bolivia                         |
|                 | *Citrus sinensis* (L.) Osbeck  | Investigate, rescue and report popular knowledge about medicinal plants | Stomach and liver | -------- | -------- | Manaus, Brazil                            |
|                 | *Citrus cf. auranantium* L.    | Investigate, rescue and report popular knowledge about medicinal plants | Anemia                            | -------- | -------- | Manaus, Brazil                            |
|                 | *Eucalyptus* sp.               | Investigate, rescue and report popular knowledge about medicinal plants | Fever                             | -------- | -------- | Manaus, Brazil                            |
| **Myrtaceae**   | *Eugenia malaccensis* L.       | Investigate, rescue and report popular knowledge about medicinal plants | Anemia                            | -------- | -------- | Manaus, Brazil                            |
| **Zingiberaceae**| *Zingiber officinale* Roscoe   | Check plants used by traditional medicine | Cough                             | Syrup          | Oral | Ilha do Mosqueiro, Brazil                  |

**Note:** The table lists plants used by traditional medicine, their primary actions, treatments, and the places where the research was conducted, along with the authors of the research. The table also includes plant families and species, which are categorized under different sections as per the given text.
| Family          | Genus                          | Activity                                      | Plant Parts          | Country                  | Authors                                      |
|-----------------|-------------------------------|-----------------------------------------------|----------------------|--------------------------|---------------------------------------------|
| Alpinia speciosa (Blume) D. Dietr. | Investigate, rescue and report popular knowledge about medicinal plants | Fever                           |                      | Manaus, Brazil            | Mastins et al., 2018                        |
| Alligatoridae   | Caiman crocodilus             | Conduct research with traditional healing experts | Psychoactive         | Barcelos, Brazil          | Santos et al., 2012                        |
| Paleosuchus trigonatus | Conduct research with traditional healing experts | Psychoactive         |                      | Barcelos, Brazil          | Santos et al., 2012                        |
| Humiriaceae     | Endopleura uchi (Huber)       | Check plants used by traditional medicine     | Inflammation and diabetes | Cooked, Oral             | Ilha do Mosqueiro o, Brazil                 |
| Schistostemon macrophyllum | Conduct research with traditional healing experts | Contraceptive         |                      | Barcelos, Brazil          | Santos et al., 2018                        |
| Burseraceae     | Protium amazonicum (Cuatrec.) | Conduct research with traditional healing experts | Analgesic             | Barcelos, Brazil          | Santos et al., 2012                        |
| Protium cf. aracouchini (Aubl.) | Conduct research with traditional healing experts | Analgesic             |                      | Barcelos, Brazil          | Santos et al., 2012                        |
| Protium cf. heptaphyllum (Aubl.) | Conduct research with traditional healing experts | Analgesic             |                      | Barcelos, Brazil          | Santos et al., 2012                        |
| Cichlidae       | Acaronia nassa                | Conduct research with traditional healing experts | Respiratory system   | Barcelos, Brazil          | Santos et al., 2012                        |
| Crenicichla cincta | Conduct research with traditional healing experts | Respiratory system   |                      | Barcelos, Brazil          | Santos et al., 2012                        |
| Mesonauta insignis | Conduct research with traditional healing experts | Respiratory system   |                      | Barcelos, Brazil          | Santos et al., 2012                        |
| Satanoperca jurupari | Conduct research with traditional healing experts | Respiratory system   |                      | Barcelos, Brazil          | Santos et al., 2012                        |
| Poaceae         | Cymbopogon citratus           | Check plants used by traditional medicine     | Stomach              | Cooked, maceration and infusion | Ilha do Mosqueiro o, Brazil                |
| Oryza sativa L.  | Describe traditional medicine and analyze plants that can be | Stomach              | Decoction, toasting and | Intern use                | Porvenir, Bolivia                         |
|                 |                               |                                               |                      |                          | Mesquita and Tavares-Mastins, 2018          |
|                 |                               |                                               |                      |                          | Hajdu and Hohmann                          |
| Family       | Genus                  | Species Information                                                                 | Uses                                                                 | Use method               | Place of use                                | Authors                                      | Year |
|--------------|------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------|---------------------------------------------|----------------------------------------------|-------|
| Celastraceae | Maytenus krukovii      | Collect information on plant ethnomedicine in general                                | Kidneys                                                              | Infusion                 | Intern use                                  | Paranapura, Bolivia                           | 2012  |
| Amaranthaceae| Chenopodium amboioides | Select species for the treatment of gastrointestinal disorders; rescue traditional knowledge about medicinal plants | Diarrhea, nausea, stomach pain and tuberculosis                      | Decoction                | ----                                        | Ahaetetuba, Brazil and Rondônia, Brazil      | 2016  |
|              | Alternanthera dentata  | Rescuing traditional knowledge about medicinal plants                                 | Infections and inflammation                                          | Infusion and decoction   | ----                                        | Rondônia, Brazil and Santos and Lima         | 2014  |
|              | (Moench) Stuchlik ex R.E.Fr. |                                                                                       |                                                                      |                          |                                             |                                              |       |
| Malvaceae    | Ceiba pentandra (L.)   | Recognize the plants used to treat women's illnesses                                 | Fertility                                                            | Maceration               | Bath and oral                               | Leticia, Colombia and Puerto Nariño, Brazil   | 2015  |
|              | Gaertn.                |                                                                                      |                                                                      |                          |                                             | Castro, Colombia and Puerto Nariño, Brazil    |       |
|              | Gossypium herbaceum L. | Recognize the plants used to treat women's illnesses                                 | Fertility and menstrual cramps                                       | Decoction                | Oral                                        | Leticia, Colombia and Puerto Nariño, Brazil   | 2015  |
|              |                        |                                                                                      |                                                                      |                          |                                             | Castro, Colombia and Puerto Nariño, Brazil    |       |
|              | Hibiscus sabdariffa L. | Recognize the plants used to treat women's illnesses                                 | Regulation of menopause                                              | Infusion                 | Oral                                        | Leticia, Colombia and Puerto Nariño, Brazil   | 2015  |
|              |                        |                                                                                      |                                                                      |                          |                                             | Castro, Colombia and Puerto Nariño, Brazil    |       |
| Meliaceae    | Carapa guianensis Aubl.| Conduct research with traditional healing experts                                   | Anti-inflammatory and dermatological and urinary disorders           | Exudato                  | ----                                        | Barcelos, Brazil                             | 2012  |
| Sapindaceae  | Melicoccus lepidopetalus| Describe traditional medicine and analyze plants that can be investigated pharmacologically | Diarrhea and dysentery                                              | Decoction                | Intern use                                  | Porvenir, Bolivia                            | 2012  |
|              | Radlk.                 |                                                                                      |                                                                      |                          |                                             | Hajiud and Hohmann                           |       |
| Family | Genus                  | Activity                          | Preparation          | Use       | Location                        | Reference                |
|--------|------------------------|-----------------------------------|----------------------|-----------|---------------------------------|--------------------------|
| Cucurbitaceae | *Scoparia dulcis* L.   | Recognize the plants used to treat women's illnesses | Infusion             | Intern use | Leticia, Colombia and Puerto Nariño, Brazil | Castillo 2015           |
|         | *Lagenaria siceraria*  | Describe traditional medicine and analyze plants that can be investigated pharmacologically | Infusion, grinding and decoction | Shower   | Porvenir, Bolivia                | Hajdu and Hohmann 2012    |
|         | *Citrullus lanatus*    | Describe traditional medicine and analyze plants that can be investigated pharmacologically | Grinding and decocion | Intern use | Porvenir, Bolivia                | Hajdu and Hohmann 2012    |
|         | *Cucurbita sp.*        | Describe traditional medicine and analyze plants that can be investigated pharmacologically | Grinding and decocion | Massage   | Porvenir, Bolivia                | Hajdu and Hohmann 2012    |
| Bignoniaceae | *Crescentia cujete* L. | Recognize the plants used to treat women's illnesses | Maceration and crude | Intern and external use | Leticia, Colombia and Puerto Nariño, Brazil | Castillo 2015           |
|         | *Tabebuia impetiginosa* | Describe traditional medicine and analyze plants that can be investigated pharmacologically | Decocion              | Intern use | Porvenir, Bolivia                | Hajdu and Hohmann 2012    |
|         | *Tabebuia aurea*       | Describe traditional medicine and analyze plants that can be investigated pharmacologically | Decocion              | Intern use | Porvenir, Bolivia                | Hajdu and Hohmann 2012    |
| Cyperaceae | *Cyperus articulatus* L. | Check plants used by traditional medicine | Cooked               | Oral      | Ilha do Mosqueiro, Brazil        | Mesquita and Tavares-Mastins 2018 |
|         | *Cyperus prolixus* Kunth | Collect information on plant ethnomedicine in general | Crushed or chewed     | ---------- | Parana, Peru                      | Odonne et al., 2013      |

Source: Authors.
4. Discussion

Ethnobotany is considered an important area of science, as it studies the ecological and cultural influences of plants from ancient and modern society, with great repercussions in pharmacology. In this context, ethnobotanical research extracts information about folk knowledge regarding plants so that studies that aim their beneficial use can be carried out. Thus, in addition to valuing folk knowledge, it can develop technologies to take advantage of these sustainable resources (Cragg; Newman, 2013).

One of the most important practices related to ethnobotany is called a blessing, which is a healing alternative practiced by women, usually called folk healers, who aim to heal through the use of plants and religion (Júnior et al., 2013). According to the evolutionary process, it is observed that women have most of the knowledge of the use of medicinal plants and, thus, the responsibility to take care of family health falls on them (Vásquez et al., 2014). Therefore, the main source of medicinal plants are the backyards of the houses, being them cultivated directly from the ground or flower beds, and, in the background, the forest also ends up serving as a means of access (Carniello et al., 2010).

In the Amazon region, which is home to various indigenous tribes, this practice is widely used by shamans, usually in rituals associated with supernatural factors. In addition to that, plants are also used as amulets, to scare the evil eye, during childbirth and religious rituals (Rocha, 2014). In this place, the knowledge related to the use of medicinal plants is orally transmitted from generation to generation (Freitas, 2014), that is, this knowledge is part of the culture of most people.

In this context, there are studies that indicate a national trend of deficit of scientific knowledge on the part of health professionals and the general population regarding Integrative and Complementary Practices, and a large part of pre-existing knowledge is conditioned to knowledge passed on through parental relationships and/or isolated events (Goés; Silva; Castro, 2019).

In this region, the main way of preparing medicinal plants is tea, which can be prepared in four main ways: (1) infusion, which consists of putting the contents of the plant in boiling water for 15-20 minutes, letting it rest for 5-10 minutes and then straining it is more used for the soft parts of plants, such as flowers or leaves; (2) decoction, which consists of placing the material in cold water and cooking it for 5-30 minutes and then straining it, is indicated for the hard parts of the plant, such as stems, roots, and barks; (3) maceration, which consists of placing the contents in cold water for 10-24 hours and then straining it is used for different parts of the plant, such as flowers, leaves, seeds, stems, roots, and barks; (4) herbal tea, which consists of placing the contents in a pan with boiling water for 5 minutes and then straining it, is used for herbs (Who, 2018).

Medicinal plants are often used in powder form, made from the dried plant, since crushing and sifting is necessary. Then, this powder can be used to prepare infusions, decoctions, or oils. Besides, juices are also widely used, needing only to have its herbs crushed and then strained. Syrups are prepared with a mixture of 50% juice, decocted or macerated, and 50% honey. As a form of external use, poultice stands out, a form in which fresh or dried herbs are used, which is placed directly on the spot you want it. The bath is also an external use form, because despite being prepared from an infusion, instead of ingesting it, it is used to wash the body (Who, 2018).

Other ways of using medicinal plants involve inhalation, which consists of placing the contents in boiling water and slowly inhaling the released steam, and tincture intake, prepared as if it were a maceration, but using alcohol, preferably cereals, being consumed in drops diluted in cold water, ointments, or rubs. The tincture form is the one that most preserves the active principles of medicinal plants, since most are soluble in alcohol (Who, 2018).

Even with people’s access to traditional medicine, medicinal plants are still widely used for maintaining health in some communities in the Amazon (Vásquez et al., 2014). In this study, the main botanical families used in this region were analyzed with Fabaceae being the most frequent, presenting species pointed out by the population as effective in the treatment
of gastrointestinal alterations, it is usually used in the form of infusing or cooked (in the colloquial language) for cases of diarrhea and abdominal pain. In addition, they are species used to treat infections, inflammations, liver disorders, and even cancer (Frausin et al., 2015; Gois et al., 2016; Rengifo-Salgado et al., 2017) (Table 1, columns 1, 2, and 4).

The Euphorbiaceae and Rubiaceae families described in different studies are identified by the population as useful for liver, gallbladder, stomach, and kidneys’ alterations’ relief, in addition to pain and fever reducing. These species are mainly used in the forms of decoction, macerated or infused (Odonne et al., 2013; Santos et al., 2014; Castillo, 2015; Giovannini, 2015) (Table 1, columns 1, 2, and 4).

Species of the Solanaceae Family are listed by the population as effective for treating rheumatic alterations and reducing fungal infections. The main ways of preparing and using these species are tea, juice, poultice, and tincture (Polesna et al., 2011; Castillo, 2015; Gois et al., 2016) (Table 1; columns 1, 2, and 4).

Different species belonging to the Asteraceae, Annonaceae, Poaceae and Burseraceae botanical families have been reported to have analgesic potential, to reduce stomach pain and improve gastritis, being prepared in various forms, such as infusion or decoction (Veiga et al., 2015; Gois et al., 2016; Rengifo-Salgado et al., 2017; Mesquita et al., 2018) (Table 1; columns 1, 2, and 4).

The Rhamnaceae and Apocynaceae families present botanical species used by the population for the treatment of malaria, that represents an endemic disease for the Amazon region which can be explored by parasitic research groups, so that better therapies against it can be developed (Oliveira et al., 2015; Veiga et al., 2015; Gois et al., 2016) (Table 1; columns 1, 2, and 4).

Other botanical families were listed by the Amazon region population and were used for intestinal and respiratory disorders, anemia, headaches, and fever, among others (Table 1). This knowledge, full of inaccuracies, especially with regard to the method of preparation, indications and scope of the use of plants and herbal medicines, can lead to treatment failure, leading to a future disbelief in the use of this type of treatment by the patient. (Santos; Léda; Oliveira, 2018).

Folk knowledge about medicinal plants has awakened governmental interest, a fact that has supported policies that aim to highlight the importance of alternative medicine for more effective and humanizing health care (Brazil, 2000). Furthermore, there is still a lack of scientific studies that prove the pharmacological properties of the various medicinal plants existing in Brazil, in order to inform the correct dose to be used, the proper method of preparation, the maximum time that it can be stored, the indications and possible drug interactions that may exist with both pharmacy drugs and other medicinal plants.

In this sense, Práticas Interativas e Complementares em Saúde (PICS) [Integrative and Complementary Health Practices] were implemented to integrate different medical practices, such as traditional Chinese medicine, homeopathy, and herbal medicine, among others (Telesi-Júnior, 2016). PICS aim to expand therapeutic options to users of the Sistema Único de Saúde (SUS) [Unified Health System], while one of its strategies is to provide access to medicinal plants safely and efficiently (Rodrigues et al., 2006) which was further reinforced by the Programa Nacional de Plantas Medicinais e Fitoterápicos [National Program for Medicinal Plants and Herbal Medicines].

The demand for PICS has increased due to its power to guide the doctor-patient relationship as an important element in therapy, it values simple therapeutic forms, it is less dependent on technologies, and increases the patient’s autonomy over the healing process itself (Levin et al., 2001; Nogales-Gaete, 2004; Santos et al., 2012).

Folk medicine study, especially of herbal medicines, has received greater attention from pharmacological research, as they have provided science with a greater amount of information regarding active principles (Vale, 2002). In this sense, folk
knowledge provides the basis for advances in the fields of therapeutics, emphasizing the importance of updates on traditional medicine.

The limitations of the study involve the difficulty of obtaining more complete information about the plant species used in the Amazon region in published articles, in the sense of correlation with therapeutic use, the chosen plant parts, forms of preparation, route of administration, among others.

5. Conclusion

Traditional medicine, practiced through the use of medicinal plants, proves to be of great importance for the Amazon region population, so much so that it is a factor present in the culture of these people and that is passed on from generation to generation. This proves how important this practice is for complementing official medicine. In this sense, it is concluded that the practice of traditional medicine is very common in the Amazon region and is transmitted orally from generation to generation. In this practice, the use of medicinal plants in the form of tea is highlighted, with the species in the form of powder, dried or natural plants. Thus, this study serves as a basis for more in-depth pharmacological investigations to be developed based on the information cited. Therefore, it is suggested that the strengthening of pharmacological studies involving local medicinal plants can provide scientific support for popular knowledge.

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