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Medicinal plants, biodiversity, and local communities. A study of a peasant community in Venezuela

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Objective: The main objective of this research was to record ethnobotanical data on the use and exploitation of medicinal plants, highlighting their importance for the biodiversity, culture, and tradition of a peasant community in Venezuela.

Sample/method: The study involved a population of 120 individuals, from which a sample size of 34 people was calculated using the formula for finite populations. A simple random sampling technique was employed, and all the participants were administered the TRAMIL (Traditions Medicine in Island) survey.

Statistical analysis: The ethnopharmacological table was constructed, and descriptive statistics were used for analysis.

Results: A total of 116 species of medicinal plants were documented to treat various health conditions. The informants reflected through their responses that they used medicinal plants in the first instance to address a health condition, employing varied forms of plant preparation, which include decoction (65.16%), raw consumption (16.77%), maceration (8.38%), and infusion (7.09%). The most commonly used plant parts are leaves, flowers, fruits, bark, peels, roots, and bulbs, while the most commonly used botanical families are Lamiaceae, Fabaceae, Rutaceae, Malvaceae, Verbenaceae, Acanthaceae, Asteraceae, and Euphorbaceae. On the other hand, the species with the highest TRAMIL Significant Use Level were *Oregano orejón* (*Coleus amboinicus* Lour.) (68.29), Malojillo [*Cymbopogon citratus* (D.C.) Stapf.] (60.97), Tua (*Jatropha gossypifolia* L.) (34.15), Colombiana [*Kalanchoe pinnata* (Lam.) Pers.] (34.15), Poleo [*Micromeria brownei* (Sw.) Benth.] (29.27), Pasote (*Chenopodium ambrosioides* L.) (29.27), Llantén (*Plantago major* L.) (26.83), Te negro [*Phyla stoechadifolia* (L.) Small] (26.83), Yerbabuena (*Mentha* sp.) (21.85), and Curia (*Justicia pectoralis* Jacq.) (21.95).

Conclusion: The community of El Onoto de El Valle de Tucutunemo, Aragua State, Venezuela has a notable utilization of medicinal plant species in their instance to treat different health conditions, with the predominant focus on treating flu and stomach ailments. It is important to emphasize that all individuals approached through various data collection instruments reported using medicinal plants, both individually and within their families, spanning a wide range of ages from children to the elderly. This reflects that the use of medicinal plants is part of their cultural heritage and ancestral roots.

KEYWORDS

ethnobotany, medicinal plants, TRAMIL, local communities, resources of biodiversity

Introduction

Plant resources are integral part of biodiversity, and throughout history, the relationship that humans establish with these resources has been evident. It is from this interaction that the need to study this linkage emerges, leading to the establishment of ethnobotany as a discipline. According to [Barrera \(1979\)](#), ethnobotany is defined as the study of traditional botanical knowledge, which must take into account the process of knowledge acquisition, its evolution over time, and its validation within the world of experimental science. On the other hand, [Hernández \(2012\)](#) defines ethnobotany as the field of science that investigates the interrelationships established between humans and plants, through time and in different environmental spaces. Both authors highlight the importance of the relationship between humans and plants, which can be analyzed through various aspects. One notable example is the medicinal use of some plant species, which creates a very close relationship that lasts over time.

It is known that many cultures take advantage of plants for their medicinal properties, incorporating them into their strategies for treating various health conditions. Particularly, in Venezuela, the use of medicinal plants holds considerable for rural families.

The study was carried out in the Valle de Tucutunemo community, a non-urban parish of the Zamora Municipality, Aragua State, specifically in the El Onoto sector. This is a community where families demonstrate an important attachment toward using plants to treat different health conditions. Despite the evident reliance on plant-based remedies, there was no documented information on this practice. Therefore, it was necessary to conduct a study with scientific rigor that would allow recording ethnobotanical data on medicinal species and their uses within this community.

This study was conducted using the methodology of the Traditions Medicine in Island Program (TRAMIL), which aims to provide scientifically proven alternatives to synthetic drugs by improving and rationalizing popular therapeutics based on the use of medicinal plants. Without denying the importance of institutional medicine, which is indispensable for treating severe cases, the scientists of the program try to learn more about traditional practices to differentiate what is mere belief from what is useful and effective, thereby enabling the people of the village to solve most of their health problems effectively and affordably ([Piojan, 2004](#)).

[Durán et al. \(2018\)](#) conducted a study of great value, highlighting the extensive use of the TRAMIL methodology over 35 years in Primary Health Care (PHC), particularly in Caribbean Basin's medicinal flora. The authors point out that primary health care, strategies for the promotion of well-being and integral health, equity and the social, cultural and economic development of communities, require practical and socially acceptable methods, one of these methods being the use of scientifically validated plant remedies for preventive or curative purposes for various common ailments. It is also important to note that studies of this nature have also benefited institutions such as health ministries in tropical regions. They have incorporated validated popular knowledge into the education and training of health professionals as well as program development.

Area of research

The Tucutunemo Valley, com coordenadas 10° 4' 9" N and 67° 27' 35", is an area inhabited by Carib Indians who, according to [Botello \(1982\)](#), practiced agriculture collectively. The El Onoto community is located in this agriculturally oriented valley, evolving from activities related to coffee cultivation in the mountainous area near the town, where they initially settled in an improvised manner at the foot of the hill. With the implementation of the Agrarian Reform in Venezuela in 1960, they were able to settle as a more organized community ([Consejo Comunal de El Onoto, 2013](#)). However, it is important to note that there is no health center in this community, and the families who live in this community must seek medical care at the nearest clinics and hospitals.

Sample and method

Within the quantitative approach, the sample constitutes a subgroup of the population from which data are collected and should be representative of that population ([Hernández et al., 2003](#)).

A simple random sampling method, which ensures all elements of the population have the same probability of being selected, was employed.

The sample size was calculated using the formula for finite populations ([Balestrini, 2006](#)), assuming that the population for the study was 120 people.

$$n = \frac{4pq}{4qp + (N - 1)E^2}$$

Where:

n = sample size

N = population size = 120 people (2013 Census)

4 = test statistic at 95% confidence level

E^2 = maximum permissible error (15%)

p = probability of success (0.5)

q = probability of failure (0.5)

In this case $n = 33.62$, which is approximately 34 people; however, the instrument was applied to a larger number, exactly 41 people.

At the beginning of the research, informed consent was obtained from this community and its inhabitants, through its organizational structure called the Communal Council. A data collection instrument based on the TRAMIL methodology ([TRAMIL, 2014](#)) was applied to the extracted sample. This instrument comprehensively captured information including the origin of information data on health problems, identification of plants used for treatment of health problems, traditional uses of these plants, and ways of obtaining knowledge. In this research, the person of legal age in each family who was at home when the instrument was applied was surveyed, and he/she had to provide information about the family group.

Concerning the plants reported by the respondents, it was essential to ensure their reliable identification. For this purpose, plant specimens were collected at the same time as the survey was carried out, in addition to pressing and identification of the samples

collected. It is important to note that we revisited the survey site to make a new collection, if the initial sample taken did not allow for safe identification.

This survey established in the Caribbean Folk Medicine Applied Research Program (TRAMIL), which supports the established methodologies for ethnobotanical studies, is of utmost importance, since it allows to make viable the guidelines of the OMS (2000), which urged the member states to carry out a complete evaluation of their traditional medicine systems; to systematically make an inventory and a preclinical and clinical study of the medicinal plants used by the practitioners of traditional medicine and the population.

The TRAMIL survey adopts an approach that extends beyond the mere popular use of medicinal plants. Instead, it begins with the symptoms or health conditions as perceived by the human groups collaborating with the surveys, which results in the creation of a list of health conditions along with their respective plant species utilized by the communities to address them, thereby being the beginning of more specific studies of these species.

The Strategy on Traditional Medicine 2014–2023 (OMS, 2014) states that the lack of research data is the first difficulty faced by Member States regarding regulatory issues related to the practice of traditional and complementary medicine. Therefore, it is important to incorporate methodological tools that contribute to solving this problem.

The variables handled in the research were the following: information on botanical species used and uses of medicinal plants in the community (see Table 1).

Instrument

The instrument used in this research was the Traditions Medicine in Island (TRAMIL) survey, which included the origin of the information, data on the health problem, data on the identification of the plants used to treat the health problem, data on the traditional uses of the plants, and ways of obtaining the knowledge. Similarly, only those uses of plant parts cited with a frequency $\geq 20\%$ among all respondents who indicated using plants as their first resource for health condition, were taken into account, considering these as “Significant Uses,” (TRAMIL, 2014).

Structure of the instrument

The following is a description of each of the parts that make up the instrument:

1. Origin of the information.

This first part contains the informant’s name, age, address, place of birth, and time of residence in the community.

2. Health problems.

The local name of the health problem, a description of the symptoms experienced, and the first resource used the last time the problem occurred.

3. Identification of the plants used to treat the health problem.

The names of the plants, origin of the plants used (whether wild or cultivated), and the location where the plant is found (backyard, shopping, or outside the house) are included, and the permission to collect the plant must be requested.

4. Traditional uses of plants.

The variables recorded include the part of the plant used to prepare the traditional remedy, amount needed to prepare the remedy, mode of preparation, amount of remedy administered each time, number of times the remedy is administered per day, indications for administering the remedy if the patient is a child, results obtained when using this remedy (excellent, good, fair, poor, or bad). Observations on whether this remedy can be dangerous, highlighting the most vulnerable population, and the reason for this possible danger were also recorded.

5 Ways of obtaining knowledge.

The ways of obtaining knowledge include the sources of ancestral knowledge.

Analysis

A table of ethnopharmacological information of the medicinal plants used in the community of El Onoto de El Valle de Tucutunemo was constructed, which contains relevant information such as the botanical family and species, popular names, parts used, popular uses, preparation methods, number of citations in the research, and the TRAMIL Meaningful Use level.

Herbarium specimens were prepared and taxonomically identified through the use of reference literature and were given to the community for safekeeping.

The TRAMIL Significant Use Level (NUST) for each of the species recorded expresses those medicinal uses that are cited with a frequency $\geq 20\%$ by the people surveyed. They can be considered significant from the point of view of their cultural acceptance and, therefore, deserve their evaluation and scientific validation (TRAMIL, 2014). This index is calculated by dividing the number of citations for the species by the number of informants surveyed.

$$NUST = \frac{\text{Use of the species(s)}}{\text{No of informants surveyed}} \times 100$$

TABLE 1 Research variables.

Objective	Variables/categories	Indicators	Techniques/instruments
Record ethnobotanical data on medicinal plants from the El Onoto community, through the TRAMIL methodology.	Information on species and uses of medicinal plants used in El Onoto.	Local name of species of medicinal plants, parts of the plant used, traditional use, method of preparation, amount used, dosage, health conditions addressed with medicinal plants, most used species and families.	TRAMIL questionnaire.

Descriptive statistics were used to present information on the age of the informants, the methods of preparation and administration used, the parts of the medicinal plants most used by the informants, and the botanical families with the greatest number of species present in the community.

Results

The selected instrument was applied to 41 people, of which 29 were women and 12 men, with an age ranging from 24 to 73 years. All the informants use medicinal plants for individual consumption and for the whole family, using various forms of preparation and administration.

The study made it possible to determine that in the community, they use various parts of the plants, highlighting 10 plant species with a significant level of use >20%.

Recording of ethnobotanical data on medicinal plants

First, with all the information collected through the TRAMIL instrument, an ethnopharmacological information table, which contains data provided by the informants, was constructed (Table 2). These data were organized in a database using Microsoft Excel.

In the community studied, 116 species of medicinal plants were recorded to treat different health conditions, where each species was identified with its local name, part(s) of the plant used, its

traditional use, botanical family, scientific name, and the number of citations provided by the people surveyed about each species.

Most used forms of preparation and administration

It can be evidenced that, in the great majority, the form of preparation is decoction, with approximately 65.16%; however, there are other forms of preparation, such as raw extract (16.77%), maceration (8.38%), infusion (7.09%), and some less conventional forms such as roasting and frying, although these are less frequently reported.

As for the administration of these preparations, they are mostly administered orally (69.02%), topically (19.42%), through baths (8.63%), or gargles (2.87%).

The way of combining these preparations is varied, where they can use the decoction method to administer it orally or topically, and the latter consists of placing the plant together with water and let it boil and place it on the area to be healed. The raw extract form is used in the form of juice, which consists of extracting the substance from plants with pressure, either to be consumed orally or through topical use. In maceration, the shredded, crushed or crushed plant is soaked in water or any other liquid; however, in the community they make it with water and use it for baths and with liquor to bottle it and use it for specific conditions, such as “blood cleansing,” “to remove phlegm,” “fertility in women.” Another raw form is the poultice, which involves placing the fresh plant directly on the skin. Additionally, poultices are made by crushing the plant

TABLE 2 Table of ethnopharmacological information.

	Family	Species	Local name	Used portion	Uses	Preparation and administration	N° C	NUS
1	Lamiaceae	<i>Micromeria brownei</i> (Sw.) Benth	Poleo	Leaves	Flu, fever, phlegm	Decoction/oral	12	29.27
2	Lamiaceae	<i>Coleus amboinicus</i> Lour.	Orégano orejón	Leaves	Flu, asthma kidney stone, kidney infection, ovarian cysts.	Decoction/oral	28	68.29
				Earache		Raw juice/oral		
3	Verbenaceae	<i>Lippia organoides</i> Kunth.	Oreganito	Leaves	Flu	Decoction/oral	6	14.63
4	Burseraceae	<i>Bursera simaruba</i> (L.) Sarg.	Indio esnuo	Cortex	Flu, cough	Decoction/oral	4	9.76
5	Apiaceae	<i>Eryngium foetidum</i> L.	Cilantro e' monte	Root and leaves	Flu, stomach pain, asthma	Decoction/oral	5	12.19
6	Myrtaceae	<i>Psidium guajava</i> L.	Guava	Leaves, fruit peel and root	Diarrhea, vomiting, stomach pain	Decoction/oral	8	19.51
7	Poaceae	<i>Cymbopogon Citratus</i> (DC.) Stapf	Malojillo	Root	Diarrhea, vomiting, stomach pain	Decoction, infusion/oral	25	60.97
				Leaves	Flu, chiquinguya, cold, fevers			
8	Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	Lemon	Fruits	Diarrhea, vomiting, stomach pain,	Raw juice/oral	8	19.51

into a pulp and applying it in the form of dressings. The oral infusion, which is rarely used, is when the water is placed to boil and then poured onto the plant. The mixture is then covered and left to steep before being consumed.

Parts of the most used medicinal plants

The parts of the plants indicated as the most used in the popular preparations were leaves, bark, fruit shells, flowers, unripe flowers, fruits, and acorns in some species, such as the banana. In addition, roots and bulbs are used, with leaves being predominantly the most used with 57%, followed by the root with 11%, bark and flowers with 7% each, and the other parts of the plants are used with <4%.

In this community, just as they use mixtures of plant species, they also use mixtures of different plant structures, that is, they can combine leaves and roots, bark and fruits, among others, and of different species, to treat a health condition. An example of this is the following mixture: “A sprig of pennyroyal, a leaf of oregano, a sprig of oregano, conchita de indio esnuo, cilantro root and a small piece of onion,” with which a decoction is made and taken to cure the flu. In this combination, five botanical families are mixed, which are Verbenaceae, Lamiaceae, Burseraceae, Apiaceae, and Moryllidaceae.

Botanical families with the highest number of species present in the community

The botanical families with the highest number of medicinal plants used are Lamiaceae, Fabaceae, Rutaceae, Malvaceae, Verbenaceae, Acanthaceae, Asteraceae, and Euphorbaceae. This result coincides with those obtained in a research carried out in Cuba by [Beyra et al. \(2004\)](#), where these eight botanical families, among others, present the highest number of medicinal species used by the families of seven communities in the province of Camagüey. Similarly, in the research of [Lastres et al. \(2015\)](#) in the community Valle de la Cruz in southern Aragua, four of the botanical families were recorded with the highest number of medicinal plant species, which include Fabaceae, Lamiaceae, Asteraceae, and Acanthaceae.

The Lamiaceae family is important as a medicinal species, as reflected in several research studies carried out in this area. According to [Castello Branco Rangel de Almeida and Albuquerque \(2002\)](#), this may be due to the fact that its species are rich in essential oils, which give them medicinal properties widely recognized by the population; this is also expressed by [Carbonó-Delaho and Dib-Diazgranados \(2013\)](#), who point out that, in general, the essential oils present in the plants of this family are rich in terpenes, and these compounds are attributed to various activities in traditional medicine applications.

Medicinal plant species and the TRAMIL meaningful use level

The level of significant use TRAMIL expresses those medicinal uses that are cited with a frequency $\geq 20\%$ by the people

surveyed who use medicinal plants as a first resource for a specific health problem. In this case, the species with a frequency $\geq 20\%$ are as follows: Oregano orejón (*Coleus amboinicus* Lour.) (68.29%), Malojillo [*Cymbopogon citratus* (D. C.) Stapf.] (60.97%), Tua (*Jatropha gossypifolia* L.) (34.15%), Colombiana [*Kalanchoe pinnata* (Lam.) Pers.] (34.15%), Poleo [*Micromeria brownii* (Sw.) Benth.] (29.27%), Pasote (*Chenopodium ambrosioides* L.) (29.27%), Llantén (*Plantago major* L.) (26.83%), Tè negro [*Phylla stoechadifolia* (L.) Small] (26.83%), Hierbabuena (*Mentha* sp.) (21.85%), and Curia (*Justicia pectoralis* Jacq) (21.95%).

Health conditions recorded in the community treated with medicinal plants

The 41 people participating in this research reported that both themselves and their family members have treated health conditions with medicinal plants exclusively or in a combination with medicines prescribed by a health entity. Among the most common ailments, some of them are follows: flu, fever, kidney stones, ear pain, ovarian cysts, asthma, stomach pain, cough, diarrhea, vomiting, common cold, chikungunya, skin fungus, boils, skin infections and wounds, ovarian inflammation, tonsillitis, insect bites, sores, shingles, toothache, parasitic infections, bone fractures, inflamed colon, stomach gas, strokes diabetes, cancer, arthritis, hypertension, scabies, hemorrhoids, abundant gynecological hemorrhages, insomnia, hair loss, headaches, rashes, triglyceride and cholesterol issues, circulation problems, hepatitis, facial paralysis, measles, rubella, belly pain, lechina, rhinitis, infertility, headache, sinusitis, mumps, swollen glands, and conjunctivitis. Notably, the most common ailments reported are colds and gastrointestinal conditions.

Discussion

Through this study, the use of 116 species of medicinal plants, with many belonging to the Lamiaceae family, to treat more than 50 health conditions was reported. The plant species with the highest frequency of TRAMIL Meaningful Use were oregano orejón (*Coleus amboinicus* Lour.) (68.29%) and malojillo [*Cymbopogon citratus* (D.C.) Stapf.] (60.97%).

Similar studies, such as that conducted by [Soria et al. \(2020\)](#), which involved an ethnobotanical study in family health units in Caaguazú, Paraguay, using the Meaningful Use TRAMIL (UST) method, identified 54 botanical families, corresponding to 93 genera and 116 species, being Asteraceae the best represented with 17 genera and 21 species. The native species with the highest consensus index was *Lippia alba*, highlighting that the conditions treated with medicinal species were mainly stomach pains and non-communicable diseases such as high cholesterol, uric acid, and anxiety states.

[Ibarguen \(2021\)](#), in his work in Chocó, Istmina municipality, Colombia, applying the TRAMIL survey, also found Asteraceae and Lamiaceae among the botanical families with the highest number of species used.

[Aguaiza Quizpilema and Simbaina Solano \(2021\)](#) mapped various plants of therapeutic use of great importance in public health by conducting a study on medicinal plants and ancestral

knowledge in rural communities in the province of Cañar, Ecuador, describing 87 plants with promising therapeutic potential. These plants are considered useful in the traditional medicine of Cañar, for which they suggest conserving, preserving, propagating, and researching prophylactic doses for these plants.

Similarly, Coronado-Peña and Román (2022) carried out a study applying a TRAML survey in Arauca, Colombia and found that the most used botanical families are Lamiaceae, Asteraceae, Rutaceae, Euphorbaceae, and Fabaceae, which coincides with the five most used botanical families in this study.

Gutiérrez Nava et al. (2023) conducted an ethnobotanical study based on 73 ethnobotanical surveys conducted randomly on pilgrims (key informants) who arrived at the Basilica of Guadalupe on December 12, 2022. The analysis of the results was performed based on the states of precedence of the key informants who attended, where the information was obtained from 10 states throughout the Mexican Republic, registering 24 plant species in the ethnobotanical analysis. It was agreed that the medicinal plant with the highest rate of consensus to treat disorders of the digestive system was Chamomile (*Matricaria recutita*), due to its anti-inflammatory, sedative, antispasmodic, and antimicrobial activities.

In general, this study shows that most of the medicinal plants in this community are prepared in the form of decoction; however, there are other forms of preparation, such as raw extraction, maceration, and infusion. While the administration of these preparations is mostly done orally or topically, although the forms of combining these preparations vary.

In relation to the parts of the plants indicated as the most used in the popular preparations, leaves were predominantly the most used, followed by the use of the root.

Gutiérrez Nava et al. (2023), in a study carried out with data obtained from several Mexican states, indicated that leaves were the most used part of the plant therapeutically with 71%, together with inflorescences which represent 11%.

When comparing the report of health conditions or uses, collected in this sample, with other research, it can be noted that, in the community of El Onoto, they treat more than 50 conditions with medicinal plants, while in other areas of the country, they report less health conditions treated with medicinal plants. An example of this is the research conducted in the Macoyal peasant community in Trujillo, where 99 people were interviewed and 20 uses were reported (Bermúdez and Velásquez, 2002). The result obtained could be related to the absence in the community of a health center, having to solve in a practical and timely manner with medicinal plants. This same idea is also developed in the research conducted by Gallegos (2016), where he expresses that, in the case of rural populations, the people face more restrictions in accessing medicines for several reasons, including difficulty in accessing a pharmacy and/or a health center, as is the case of the study community.

The informants expressed that they use mixtures of plants to treat a health condition and emphasize that they have the perception that several plants maximize their medicinal properties and combine them with the use of drugs prescribed by physicians. Morales Pérez et al. (2022) state that the active ingredients of medicinal plants can interact with the components of any other

synthetic drug used at the same time and cause adverse reactions, aggravating the health situation of the consumer.

The mixture of drugs and medicinal plants, as is the case referred to by some of the participants in the study, seeking to reinforce the healing capacity of these remedies on the health condition, can generate the appearance of antagonistic actions between them or, worse, trigger a negative reaction in the person who consumes them. Definitely, this is an issue that must be addressed to ensure that families have a reliable tool at hand to take care of their health, in the event that they require it or that they so desire, but that it is efficient and safe.

According to the World Health Organization (OMS, 2014), the primary healthcare of up to 80% of the population in developing countries is based on traditional medicine, due to cultural tradition or because there are no other options, and in the case of rich countries, many people resort to various types of natural remedies because they consider natural to be synonymous with harmless. However, there are studies that point out the importance of making an effort to know and correctly handle the scientific name of plants of popular use, showing valid identifications of species and botanical families cultivated globally for their ornamental and medicinal value, in order to have greater safety and efficacy when using them (Orsini, 2021).

The gender of the people surveyed in this research was distributed among 29 women and 12 men, in which all of them presented a strong attachment to their community, where most of them were born there, or have been living in the area for more than 28 years and also come from nearby rural areas. As in this study, Díaz Mariñas (2019) conducted an ethnobotanical study in the village of La Manzanilla, San Marcos—Cajamarca in Peru, traditional knowledge resides in greater proportion in the female sex, since in this study of 15 people interviewed, 10 were women, suggesting the importance of women in the transmission of traditional knowledge.

The results obtained in this study can be analyzed in two ways. First, it may be that culturally, there is a great interest in medicinal plant species and their uses. On the other hand, the socioeconomic conditions of this community and the non-existence of a health center force the population to use them, and it may happen that this reality is not based on the traditional knowledge of the local resources of the community, but rather distorted with information from various sources on the use of medicinal plants for the care of different health conditions, thus favoring the dispersion of this knowledge about them. In relation to the importance of preserving traditional knowledge, a relevant strategy to achieve this objective is to involve the new generations in the knowledge about medicinal plants. In this regard, Guarnizo-Losada et al. (2022) point out that ethnobotanical studies in school environments are still scarce for many countries and regions; however, they emphasize that it is of great importance to continue recognizing ancestral knowledge and the valuable contributions made by the children from indigenous communities in schools regarding the use and management of plants. This is also valid for rural communities, making it possible to work from the link between the elders of the community with parents and the community in general, as a way of safeguarding the historical memory of the regions.

Knowing and documenting where medicinal plants are obtained, that is, their origin and distribution, provide tools that allow researchers and the community in general, to design short, medium, and long term conservation strategies, integrating the local knowledge of ethnic groups, which has been transmitted from generation to generation, thereby contributing to the permanence of medicinal plant species so that future generations can make use of local knowledge (Ruiz-Rosado et al., 2023).

The people participating in the research expressed that they received knowledge about medicinal plants from a family member or neighbor who knows about them, so they say they have confidence in medicinal plants and in the care of their health through this channel.

In this regard, it is essential to reflect on the role of biodiversity and the use of medicinal plants by communities. While it is true that a large proportion of the species used as medicinal plants are cultivated plants, many of them, in a considerable percentage, are wild plants that have proven medicinal properties or have been pointed out by popular knowledge (Fuentes, 2004). Jaime Muñoz (2019) points out that the geography of health acquires a relevant role in the compression of geographic space as a point of analysis for a better knowledge, compression, and analysis of the interaction of people's health with the location, and the spatial distribution of elements in the territory.

Several investigations have highlighted the use of medicinal plants as a primary option for health in rural communities, in addition to highlighting the need for the conservation of knowledge about the use of these plants and in many cases proposing how their use serves as a basis for their continued use as a therapeutic alternative (Soria et al., 2020; Lorenzo-Barrera et al., 2023; Trigueros-Vázquez et al., 2023).

Trigueros-Vázquez et al. (2023) point out that, even with official medical services, members of the Mochó and Kakchikel ethnic groups of the Sierra Mariscal, Chiapas, Mexico use and conserve plants for their medicinal properties. The study conducted by these researchers used ethnographic and ethnobotanical methodology to conclude that 97% of both ethnic groups use medicinal plants and obtain them mostly from their agroecosystems.

In the households surveyed, there is a high percentage of use of medicinal plants, which may express their strong attachment to their local traditional medicine, but, on the other hand, also suggests the absence in the community of a conditioned health center to which they can go. As a result, in many cases, the reality leads to an accelerated loss of species, which are part of the biodiversity of various areas and countries, affecting the conservation of various ecosystems, the preservation of their ancestral knowledge, and, therefore, the direct benefit to its inhabitants for the primary healthcare needs.

Carballo et al. (2005) point out that, sometimes, the increase in the use of manufactured products has resulted in a decrease in the consumption of traditional preparations with medicinal plants, but in most rural areas, traditional folk medicine is still used to the same or greater extent than pharmaceutical formulations. In some cases, traditional treatments replace academic medicine. In this regard, Jaime Muñoz (2019) reports that, in research conducted in rural communities in Chile, the people interviewed claim to prioritize the use of medicinal plants for treating health conditions, before seeking care at health centers. This is reflected in the fact that,

in most cases, they maintain orchards or gardens containing medicinal plants.

The rural community where the research was carried out has stated through interviews that they use plants with medicinal use to alleviate diseases, so, in most of the houses, there is a garden or an orchard where people grow these plants.

Conclusion

The community of El Onoto de El Valle de Tucutunemo, Aragua State, Venezuela exhibits a notable utilization of medicinal plant species in their instance to treat different health conditions, with the predominant focus on treating flu and stomach ailments. It is important to highlight that all individuals approached through various information collection instruments reported using medicinal plants, both individually and within their families, spanning a wide range of ages from children to the elderly. This reflects that the use of medicinal plants is part of their cultural heritage and ancestral roots.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

Ethics statement

The studies involving humans were approved by Bioethics Committee of the Instituto de Estudios Científicos y Tecnológicos (IDECYT)-UNESR. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

OM: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Data curation, Validation, Writing – review & editing. IT: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Supervision.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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