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Short Communication

Traditional Ecological Knowledge of the Use and Management of Medicinal Plants in Family Gardens in Tilzapotla, Morelos, Mexico

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Abstract

In this study, we analyzed traditional ecological knowledge related to the use and management of medicinal plants in family gardens. Using semi-structured interviews with the individuals in charge of 24 gardens, we recorded the importance of the garden and information about the use and management of the species contained. We generated a diagram of each garden, including the location of each plant species, and collected botanical samples. In a spreadsheet, we recorded the species richness, botanical and ethnobotanical information, type of management (encouraged, tolerated, protected, or cultivated) and herbarium accession number. We recorded 34 medicinal plant species. The main ailments addressed were cancer, spiritual cleansing, and digestive and respiratory conditions, which are treated using *Pereskia aculeata, Dysphania ambrosioides*, and *Verbesina crocata* among others. The main management types were cultivation (e.g., for *Manilkara zapota, Dysphania ambrosioides,* and *Azadirachta indica Citrus*) and encouragement (e.g., for *Tournefortia hirsutissima*, *Verbesina crocata*). Plants were obtained by purchase from markets, extraction from natural vegetation, or trading. The placement of plants within the garden was driven by family need, water availability, and configuration of the dwelling. The plants are well managed by the interviewees' practices, reconfirming both the extent of the interviewees' traditional ecological knowledge and the plants' importance in their daily lives. A central benefit is the occupational therapy of tending to the garden. The value assigned to the family garden is also a marker of cultural identity.

Keywords: Traditional ecological knowledge; Medicinal plants; Use; Family gardens

Introduction

Traditional ecological knowledge (TEK) refers to the body of knowledge, practices, and beliefs around the environment and natural resources. TEK evolves through adaptive processes and is transmitted through cultural channels, contributing to the adaptability and resilience of agroecosystems. With TEK, the resources necessary for the subsistence of human communities persist, assisted by management practices [1]. Family gardens can be dated back to at least the third millennium, C.E. [2], and they continue to exist to this day because they provide a way to culturally adapt to the land and a mechanism for self-sufficiency of material goods [3].

The species that are utilized in family gardens have multiple uses that respond to the family's needs, and management strategies generally include "tolerance," "encouragement," or "protection."

Tolerance is a management practice that involves actions that aim to maintain within humanized environments the useful plants that occupied the space before it was transformed; encouragement (also known as induction), includes different strategies aimed at increasing the population density of useful species in a plant community, for example by sowing seeds or propagating vegetative structures; and protection includes care such as eliminating competing plants and predators, applying fertilizers, pruning, and protecting against environmental factors [4].

The knowledge that arises from interactions between farmers and natural resources within family gardens leads to the generation of further TEK. The useful species have profound spiritual value, which reaffirms the continuity of tradition and identity of a population. The importance of the gardens is due to their provision of food and medicine, among other products, such that they are associated with both nutritional and economic sustenance [5,6]. The floristic composition of family gardens changes over time due to several factors, including the owners' management of this agroecosystem [4,6]. The high diversity of species in the gardens plays an important socioeconomic and ecological role through the production of medicinal and edible plants, among other products [7]. Family gardens have surged in significance in recent years. They are versatile in that they can be adapted to different functions. Generally, these systems are composed of vegetables, medicinal plants, condiments, and sometimes even include the *milpa* (a traditional polyculture of corn, beans, squashes, and other useful plants). On the whole, family gardens provide food and contribute to family well-being [8,9].

Medicinal plants are ubiquitous in family gardens, according to [10], and they continue to be recognized as the most valuable resource in indigenous traditional medicine. In Mexico, approximately 6,000 species of plants have medicinal uses, and the majority of these are native (3,478) and wild (2,670) [11]. The objective of this study was therefore to analyze the TEK related to the use and management of medicinal plants in family gardens in Tilzapotla, Morelos, Mexico.

Materials and Methods

Tilzapotla is located in the south of the state of Morelos (18º 37′02′′ y 18º 38′32′′ N - 99º 17′ 27′′ y 99º 19′ 26′′ O) at an average altitude of 1004 m in the municipality of Puente de Ixtla. The climate is Aw_o(w)(i') gw", defined as a warm climate, with a mean annual temperature of 26.6°C [12].

Sample design

We counted the family gardens in the community using orthophotographs at a scale of 1:5000. We then performed tours to verify the maps in the field. The number of gardens counted in the images was 265. Using a random draw with no replacement, we selected 27 family gardens (10% of the total gardens). In three gardens we were unable to gather information because the owners decided not to participate. Information on the medicinal plants used was obtained through semi-structured interviews with the person who managed each garden [13]. To record the importance of the garden, we asked the following questions (translated from Spanish): Why do you consider your family garden important?; How much time do you devote to caring for it?; and How do you care for it? We also asked about the use and management of the species. During the tours of the family gardens, we generated a diagram, indicating the placement of the plants and management zones. We collected botanical specimens of all medicinal plants, which were taxonomically determined with the help of personnel at the herbarium (HUMO) of the Autonomous University of the State of Morelos (*Universidad Autónoma del Estado de Morelos*; UAEM), where the specimens were then deposited.

Data analysis

We quantified the species richness of the medicinal plants using a floristic inventory of all 24 family gardens, and we captured the information in a spreadsheet to document the botanical and ethnobotanical information and herbarium accession number. We classified the management. Type for each plant using the classification proposed by [14]: encouraged, tolerated, protected, and cultivated. The ailments treated using each of the plants were classified into the following categories: digestive system, respiratory system, nervous system, cardiovascular system, renal-urinary system, genito-urinary system, musculoskeletal and cardiovascular system, skin, and culture-bound syndromes [8].

Results

The total species richness of medicinal plants was 34. Table 1 shows the main species according to the ailments they are used to treat. The number of species present in the each family garden ranged from 2 to 22. The average age of the family gardens was 20 years, and there were gardens that were established as long as 65 years ago. The interviewees' descriptions of the gardens' importance were diverse (translated from Spanish): "Memories of my family," "Doing something I like," "It relaxes me," "When it's too hot, we eat here in the garden" (original: "*Recuerdos de la familia", "Hacer algo que me gusta", "Me distraigo", "Cuando hace mucho calor, aquí en el huerto comemos"*). Twenty-four families participated, each with an average of three members, who dedicated about 3.7 h/week to caring for the family garden. Most of the interviewees were women (66%), 12.5 % were men, and in 20.8% of the cases, both genders participate in tending the family garden. The average age of the participants was 51 years. In terms of institutional education, 37.5% had completed primary school,

16.6% secondary school, 16.6% high school, and 16.6% had attended university; the rest (8.3%) had not completed primary school.

Species (scientific and common name)	Ailments and preparation	Management practices	Growth habit	Voucher number
Dysphania ambrosioides (L.) Mosyakin & Clemants Epazote	For *espanto* (folk illness linked to fright), as an infusion combined with white wine. For parasites, as an infusion. For sore throat, as an infusion. For scorpion sting, as an infusion and herbal bath.	Cultivation and promotion	Herb	32963
Tournefortia hirsutissima L. Tlachichinol	For rash, hives, *hervor de sangre*, and *chincual**, taken as an infusion or soaked and used in herbal baths.	Protected	Shrub	32955
Pereskia aculeata Mill. Uña de gato	For cancer, fruit in blended drink or leaves in salads. For gastritis, leaves as infusion or blended drink.	Cultivation	Shrub	32972
Dodonaea viscosa Jacq. Chapulixtle	To 'clean the blood', as an infusion. For cold-induced pain and scorpion sting, as poultice.	Tolerance	Shrub	33055
Verbesina crocata (Cav.) Less. Capitaneja	For gastritis, as an infusion. To reduce inflammation of the digestive system, as blended drink.	Protection	Shrub	32940
Brickellia pavonii (A. Gray) B.L. Turner Prodigiosa	For colic, as an infusion.	Protection	Shrub	32933

Table 1: Important medicinal species in home gardens of Tilzapotla, Morelos: Species, ailments and preparation, management practices, growth habit, and voucher number.

The most common ailments referred to in the interviews were cancer, spiritual cleansings, and digestive and respiratory conditions, which are treated using *Pereskia aculeata* Mill., *Dysphania ambrosioides* (L.) Mosyakin & Clemeants, and *Verbesina crocata* (Cav.) Less., among others. The main management type was cultivation, of species such as *Manilkara zapota* (L.), *Dysphania ambrosioides, Azadirachta indica* A. Juss., *Citrus* L., followed by encouragement of *Tournefortia hirsutissima* Blanco and *Verbesina crocata* among others. Management included: i) ways of obtaining plants: purchasing in local or more distant markets, extracting from natural vegetation, or by trading with family members or neighbors, ii) watering the plants: which is variable depending on the ambient temperature and requirements of each species, iii) distribution of the plants among management zones: this was according to the family's needs, availability of water, configuration of the dwelling, distribution of land among children, and/or size of enclosures for domestic animals. The interviewees

affirmed that men propagate the large plants while smaller plants are under the charge of women.

Discussion

The species richness recorded in this study was similar to the 27 species documented by [15] in El Zapote, Morelos. This is a high number, considering the small population (30 homes), and is likely because the community is far from urban areas and does not have public or private healthcare services. This is also consistent with the explanation of [16], who recorded 69 species in gardens, that medicinal plants are an economical and quickly accessible option to treat ailments.

In this study, we found that older adults have more extensive knowledge of medicinal plants and are more interested in cultivating them in their gardens, since it is a way to have easy access to them. This finding coincides with [17,18]. In addition, our finding that conditions of the digestive system were among the most commonly treated ailments using medicinal plants coincides with [19,20].

The family garden is an important multi-functional space, where the availability of plants improves the family's surroundings. This study also allowed us to explore the value each person assigns to the family garden as a marker of cultural identity. Regardless of their age, a central aspect of the importance of family gardens is derived from their representation as occupational therapy. This was exemplified by the response of Mr. Francisco Ocampo, age 83, when he stated (translated from Spanish): "If I didn't work in the garden, I'd be dead already" (original: *"Si no trabajara en el huerto, ya me hubiera muerto"*).

In the management practices described in this study, one of the predominant ways of acquiring plants is collecting wild species and transplanting them in the gardens. The women of Tilzapotla have extensive TEK and collect multiple species from natural vegetation, including "*prodigiosa*," *Brickellia pavonii* (A. Gray) B.L. Turner; "*anís*," *Tagetes filifolia* Lag.*;* "*capitaneja*," *Verbesina crocata*; "*borrego,*" *Acacia acatlensis* Benth.*; "jarilla," Senecio salignus* DC. and "*bonete,*" *Jacaratia mexicana* A. DC.), among others. These practices coincide with [21] in Oaxaca. Another common way of obtaining plants is by trading or gifting between neighbors and family members within the community, and even those who live outside the country. Culturally, the cultivation of medicinal plants reflects the concept of exchange [7,22]. Peoples' preferences play a strong role, and the medicinal use category is one of the top uses in studies of gardens, especially when medicinal plants also have culinary uses [23-25]. These practices explain the importance of medicinal plants for the community residents.

The importance of medicinal plants is also reflected in their placement within the garden, always near the kitchen of the home.

Conclusion

Our findings evidence the interviewees' extensive knowledge of medicinal plants, which are mainly collected from natural environments. All of the medicinal species in the gardens receive good attention during the management practices, which indicates their relevant function in the daily lives of the users. As a line of future research, we suggest more detailed documentation of the effects on family health of higher species richness and more use and management of medicinal species in family gardens.

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Ethical statement: We obtained verbal informed consent from each participant under the Code of Ethics of the Latin American Society for Ethnobiology (*Código de Ética de la Sociedad Latinoamérica de Etnobiología* [26]).

Declaration of conflicts of interest: The authors declare that they have no conflicts of interest.

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