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WILD PLANTS IN THE DIET OF PEASANT FAMILIES IN TECOANAPA, GUERRERO

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ABSTRACT

Wild plants are used by peasant families for different purposes. As food, they form an important complement to the peasant diet. Currently, the diversity of available wild edible plants, many of them weeds, is declining, due to more intensive land management. The aim of this research was to document wild edible plants in the family diet in two communities of the municipality of Tecoanapa, Guerrero. Methods included 1) Interviews with elderly people; 2) Field work and collection of botanical specimens; 3) Interviews with family groups to document how collected plants are employed. Results indicate that family groups use nine species of wild plants; these plants are obtained from cultivated fields, the forest and market purchase. Four of the nine species were only available in the rainy season, and the remainder throughout the year. In the two communities, families differed in the number of species consumed, frequency and variation; the more rural community had a higher, more frequent and homogeneous consumption.

Keywords: food, harvesting, use of wild plants.

INTRODUCTION

Rural populations use wild plants, especially those associated with different farming systems or fields (Basurto, 2011), as food, medicine, fodder and ornament, among others (Hernández, 1995; Melnyk, 1995). These plants are collected for their flavor, texture, size, color and availability, making them attractive for peasant families (Casas *et al*., 2007; Albino-García *et al*., 2011). Leaves, buds and flowers that are used as vegetables are known as "quelites" in Mexico.

"Quelites" provide vitamins, minerals and other nutrients in the diet of rural families (Meléndez and Cañez, 2009; Mascorro-de Loera, 2019). In addition to being easily digestible (Linares and Bye 2011), they are a fundamental component of food culture. They are prepared and transformed in various ways, resulting in rich local gastronomic cultures (Jáuregui, 2002; Viesca and Barrera, 2011). However, most of these plants are seasonal, as they are mainly available during the rainy season.

In Mexico at the end of the nineties, 690 wild plant species were registered for use as food. Their management involved tolerance, protection and collection which has ensured their reproduction and maintenance (Caballero *et al*., 1998). Several species of "quelites" are undergoing an incipient domestication process (Casas, 2001).

In communities of the Costa Chica region of Guerrero, as well as in other places in Mexico, wild plant resources are used, among other things, for family food. Given the

importance that they have for family nutrition this research documents the current state of these resources, the eating habits in this region, and contribution to the food system. The objective of this research was to document the wild plants that are used as food by families in the communities of Xalpatlahuac and Tecoanapa in the municipality of Tecoanapa, Guerrero. The aim is to make them more visible and to generate information to support programs to strengthen self-managed nutrition, using local resources.

METHODS

Research was carried out in Tecoanapa, the municipal capital (16°59'08"N, 99°15'43"W), and the community of Xalpatlahuac (17° 0'23"N, 99°19'45"W) in the municipality of Tecoanapa, located in the Costa Chica region of the State of Guerrero (Figure 1). They cover an approximate area of 777 km^2 at altitudes between 100 and 400 m. The populations of Tecoanapa and Xalpatlahuac consists of 4,268 and 3,668 inhabitants, respectively (National Institute of Statistics and Geography-INEGI, 2010).

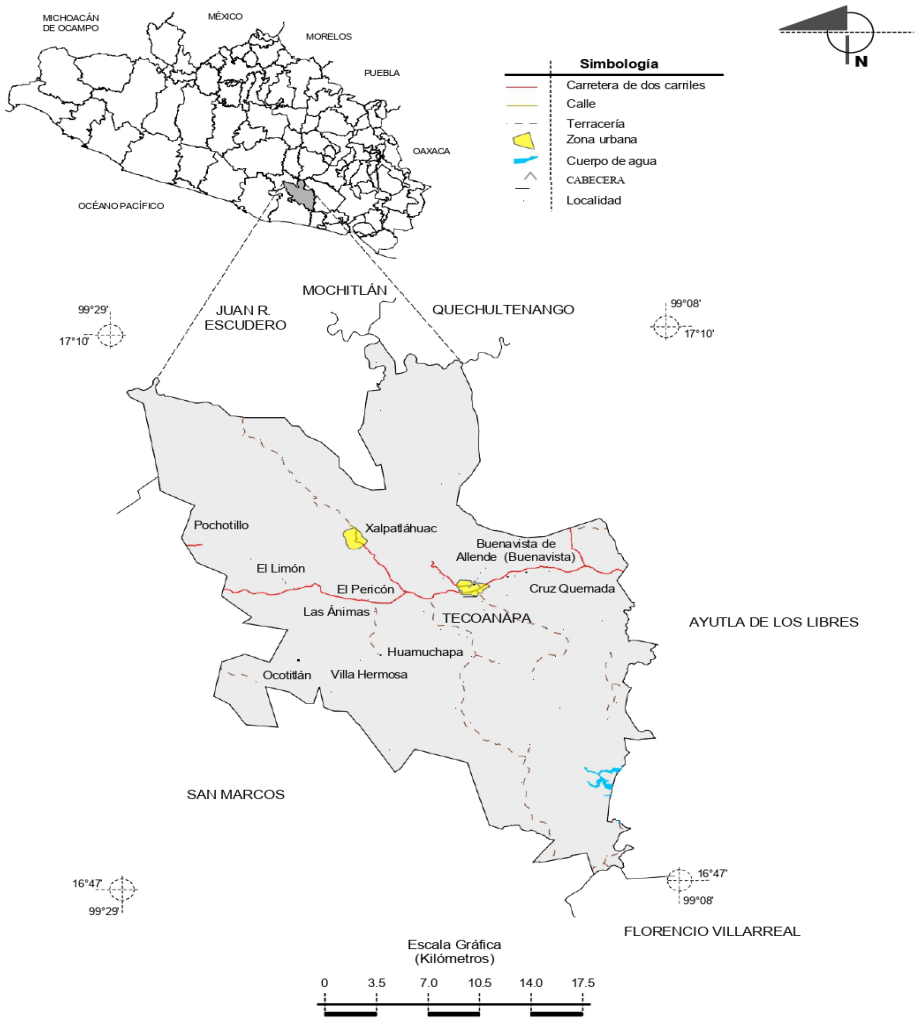
There are two types of climate in the municipality. More than half of the territory (67.4%) has a warm sub-humid climate with summer rains, with greater humidity, and the other 32.6% is warm, sub-humid with summer rains and medium humidity. The average annual temperature varies between 22 and 28 °C, and rainfall is between 1,300 and 2,000 mm. The regosol soil type is present in more than 50% of the municipality. The predominant land use is agriculture (43%), followed by natural vegetation (41%) (INEGI, 2009).

Tecoanapa is a marginalized rural area; criteria include deficient housing, wastewater, garbage and human waste disposal, among others (Secretaria de Desarrollo Social-SEDESOL, 2017). Most of the population, 76.2%, lives in poverty, and 24.1% in extreme poverty (Consejo Nacional de Evaluación de la Política de Desarrollo Social- CONEVAL, 2017). In Tecoanapa, the human development index, which integrates health, education and income, is 0.670, placing it in a higher, medium category (Programa de las Naciones Unidas para el Desarrollo-PNUD, 2019).

The main economic activities are agricultural; 64% of the economically active population is dedicated to these activities (SEDESOL, 2013). The agricultural area of the municipality is 20,562 ha; maize is cultivated on 37%. (Servicio de Información Agroalimentaria y Pesquera-SIAP, 2021).

Research methods were mixed with both qualitative and quantitative elements. Interviews, field work and participant observation contributed qualitative data. For quantitative data, a questionnaire was applied to a sample of the population. Field work was divided into three phases. First, seven exploratory interviews were conducted with elderly people about useful wild and cultivated plants. Questions were on species used, availability, sources, methods of preparation and frequency of consumption of the wild-growing plants. For cultivated species, management and intercropping combinations were investigated.

Once these interviews had been processed, the plants mentioned in the interviews were searched for, covering different areas in the communities. This field work was conducted during the rainy season (2018 spring-summer cycle), the period of the year when the



Source: INEGI, 2010.
Figure 1. Location of the municipality of Tecoanapa, Guerrero.

greatest amount of plant resources is found. They were collected and identified in the Ethnobotany Laboratory of the Colegio de Postgraduados. Specimens were deposited in the CHAPA herbarium.

In a third phase, a questionnaire of close-ended questions was applied to all families registered in the PROAGRO federal program that supports small producers with at least one hectare of productive land in use. These were 31 families in Xalpatlahuac and 21 in Tecoanapa. The interview included the following topics: a) socioeconomic attributes of the families (number of family members, age, schooling, occupation; economic activities; agricultural area and crops); b) cultivated resources and their use; c) wild plant resources (availability, sources and uses); d) changes in diet.

The research was carried out at a specific time or period of time, so it has a cross-sectional nature. The study compares the two study communities, understood as the choice of two cases to describe the similarities and differences, based on the specificities of each context (Bloch, 1999).

RESULTS AND DISCUSSION

Agriculture

Family units consist of 5 or 6 members in both Tecoanapa and Xalpatlahuac. In Tecoanapa they depend on three economic activities (agriculture, salaried employment, commerce). Agriculture represents about 60% of income; however, all families interviewed received income as employees of the municipality or a commercial establishment. In Xalpatlahuac, only two economic activities were reported; agriculture represented 90% of income, and trade 10%. About 70% of the population of the entire municipality of Tecoanapa was dedicated to agricultural activities (Flores-Sánchez *et al.*, 2011).

In the communities, land available for agriculture averaged 3.4 ha in Tecoanapa and 3.6 ha in Xalpatlahuac. *Milpa* was the most common land use system, mostly as a polyculture. Maize (*Zea mays* L.) was the main crop, and squash (*Cucurbita* spp.), beans (*Phaseolus vulgaris* L.) and chili (*Capsicum annuum* L.) were intercropped. Hibiscus flowers (*Hibiscus sabdariffa* L.) were either grown with maize or produced as a sole crop. Yucca (*Manihot esculenta* Crantz) was commonly cultivated in Xalpatlahuac.

All families interviewed grew maize, for home-consumption and sale. In Xalpatlahuac, about 70% of the families used maize for home-consumption; if depending economically on agriculture, they had a greater number of crops and greater home-consumption. In Tecoanapa, maize, beans and hibiscus flower were the main crops. Hibiscus was a main source of income, although in recent years, its cultivation had declined due to low prices and phytosanitary problems. Squash began to have greater importance in the mid-2000s, because of the good market for its seed (Flores-Sánchez *et al.*, 2011).

The products obtained from maize, beans, chili and hibiscus flowers were consumed throughout the year, whereas consumption of yucca and squash were concentrated to one or two-month period. Maize was used both for food and animal feed. Maize consumption per person in the study communities was approximately 0.5 kg per day (Flores-Sánchez *et al.*, 2015). On the Oaxacan coast, a nearby region, similar consumption has been recorded, from 2.5 to 5.0 kg per day of maize grain per family, depending on size (Navarro, 2004). Peasant families preferred to grow native maize, rather than the available hybrid, because, as Hellin (2012) points out, it had better flavor, offered easier grain removal, shorter cooking time, improved quality of tortillas and extended storage time. Production for home-consumption (subsistence) is an aspect of peasant agriculture. Family strategies focus on the production of their own food, a situation that is also a common denominator in the mountains of Guerrero. Plant species that grow spontaneously within garden plots or in backyards for food purposes are also encouraged and tolerated (Matías, 1997). As

in the study communities, crop diversification was a strategy used by family units to maintain food availability, maximize the use of their agricultural land and produce sources of income, thus minimizing risk.

Wild-growing food species

Nine species of wild edible plants were identified (Table 1). These belonged to different botanical families: Fabaceae (chipile), Solanaceae (hierba mora, tomate de pajarito and tomatillo), Smilacaceae (cocolmeca), Asteraceae (pápalo), Cucurbitaceae (bejuquillo), Piperaceae (hierba santa) and Portulacaceae (verdolaga). Most of these plants are annuals and often grow in or near cultivated fields. Some, such as cocolmeca, tomatillo, tomate de pajarito, pápalo and hierba santa remained green all year long, if growing near water such as a river or spring.

The plants were cooked in broths, used for sauces or consumed raw. Cooking over an open fire with firewood, using wooden utensils and clay containers, resulted in some of the dishes' characteristic flavor. As Mancera (2020) points out, these are aspects that characterize traditional Mexican cuisine or gastronomy.

The tender shoots of bejuquillo were used to make broth or were simply eaten raw with a little salt or as a complement to some salads. Its use was similar to that of squash shoots.

Chipile is a is a traditional food plant of the area; the leaves and tender shoots are eaten, and it is traditionally used for the preparation of various regional dishes such as tamales, or in goat or chicken broth. Other dishes with this species are known from Mexico, but in the region, preparation is limited to basic cooking techniques, such as boiling and baking. This species is native to Mexico and Central America, and may be semi-domesticated, tolerated or promoted by peasant families (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad-CONABIO, 2013). This plant provides vitamin C, minerals (Mn, Mo), phytochemicals and antioxidants; implying that it is a species with important properties for human consumption and its commercialization and consumption is recommended for all sectors of the population (Jiménez-Aguilar *et al*., 2015).

Table 1. Edible wild-growing plant species in the two study communities.

Common name	Scientific name	Gastronomic use
Bejuquillo	*Rytidostylis longisepala* (Cogn.) C. Jeffrey	Broth
Chipile	*Crotalaria longirostrata* Hook. & Arn.	Broth and tamales
Cocolmeca	*Smilax* sp.	Broth
Hierba mora	*Solanum americanum* Mill.	Broth
Hierba santa	*Piper auritum* Kunth	Quesadillas
Pápalo	*Porophyllum ruderale* var. *macrocephalum* (DC.) Cronquist	Side dish
Tomate de pajarito	*Solanum lycopersicum* L.	Sauce
Tomatillo	*Physalis philadelphica* Lam.	Sauce
Verdolaga	*Portulaca oleracea* L.	Raw or with egg

Hierba mora was used in Tecoanapa and Xalpatlahuac to make broth, boiling the tender leaves of this plant and sometimes adding rice thickening agent and to improve the flavor of the dish. Likewise it was sometimes combined with egg (beaten and fried). The plant was also used medicinally as an anti-inflammatory. This plant is widely known in Mexico and throughout the world and has been considered an important food source (Edmonds and Chweya, 1997), as it is rich in vitamins and amino acids (León, 1992).

Purslane is a plant with wide distribution throughout the world. It was used fresh or cooked in combination with other foods. Its stems and leaves were eaten fresh as a salad, or cooked with just a little oil and seasoned with salt and pepper. Due to its texture, it was added to soups and some sauces. It was commonly cooked with eggs or Mexican style eggs (with onion, tomato and chili), or with pork and green sauce. It is considered an important local food source in several regions of Mexico, as well as representing an important source of food for animals (Sarmiento-Franco *et al*., 2016).

Although the species could not be determined, because it was generally only produced as a vegetable, the cocolmecas in Mexico are native to tropical America (Cáceres *et al*., 2011). Tender shoots from the cocolmeca were used for broths or eaten raw mixed with other vegetables such as lettuce and spinach for salads. A medicinal cordial was also made from the root; which according to inhabitants helps improve kidney function. In traditional Mexican medicine, cocolmeca is also used for the treatment of obesity (Alonso-Castro *et al*., 2015).

In the study communities, hierba santa is commonly used to season various dishes, such as beans with rice, broths and pit barbecue, among others. The stem is served raw as an accompaniment to stews and the leaf is also used as a natural wrapper for fresh cheese made in the region. This aromatic plant is also known as acuyo, tlanepa, ajlán and mumu. It is used very frequently in Mexican dishes as a condiment, especially in tamales from certain areas of southern Mexico, such as tapixte in Veracruz, and pilte from southern Veracruz, Tabasco and Oaxaca. It is also commonly used in green mole, and chicken or shrimp dishes, among others (Gómez-Pompa *et al*., 2010).

Papalo was used to accompany some of the typical foods of the region such as rice with beans, picaditas, fried eggs and quesadillas. Its leaves and tender stems were eaten; either fresh or cooked. It was consumed all year round, as it grew in areas near to water bodies such as rivers or springs. Some people grew it in their backyards for easy access. As medicine, it was used mainly for stomach ailments, and as an analgesic. Species from the genus Porophyllum constitute an important element in the Mexican diet, they are known for the contribution they make in the form of vitamins and minerals; there is ample knowledge concerning this species, made evident by the diversity of names and forms of use (Castro *et al*., 2011).

The tomatillo and tomate de pajarito (which are the wild green and red tomatoes) were ground on a stone mortar for sauces, which were used to accompany a large number of dishes, such as quesadillas with hierba santa or fried egg. Additionally, sauce was fried to

cook enchiladas or chilaquiles, using these ingredients. The wild red tomato was also put into salads. This was one of the wild plants in this work that was most used for food, due to being easily combined with other ingredients. These plants represent a fundamental part of the daily diet in various regions of Mexico and are a source of bioactive elements and micronutrients, as well as minerals and vitamins B and C (Garza, 1985; Vargas-Ponce *et al*., 2015).

Availability and harvest

Figure 2 shows the availability of wild food plants throughout the year. Four species were available during 4 months, associated with the rainy season. During the months of May and June, the plots are prepared for planting, as in the month of July the rains are fully established; thus conditions exist for plants to initiate their growth and development. In other regions of the country, such as Oaxaca, the harvest period is from May to September; also related to the presence of rain (Pomboza *et al*., 2017). Some of these plants, despite not being cultivated, form an important part of the diversity of farming systems (milpa or sole crops) and offer nutritional and medicinal benefits, and receive some nurture from peasant families (Mariaca, 2013). Likewise, five species were available throughout the year, as long as there was water available.

In the community of Tecoanapa, eight of the nine reported species were collected (Table 2). The most common species included the wild cherry tomato and the papalo; more than 80% of families interviewed, collected them. Six species were employed by more than 60% of families. Men were the main collectors of these resources. They stayed longer in the garden plots and had more opportunity to undertake this activity; however, those responsible for transforming this resource for consumption, were the women.

It was also apparent that areas of collection varied. Usually they were harvested from garden plots or neighboring areas. However, this was the sole location for one species (hierba mora); the rest were also harvested from woods (*el monte*), the local word for most natural vegetation), or purchased. Although there were differences between the two

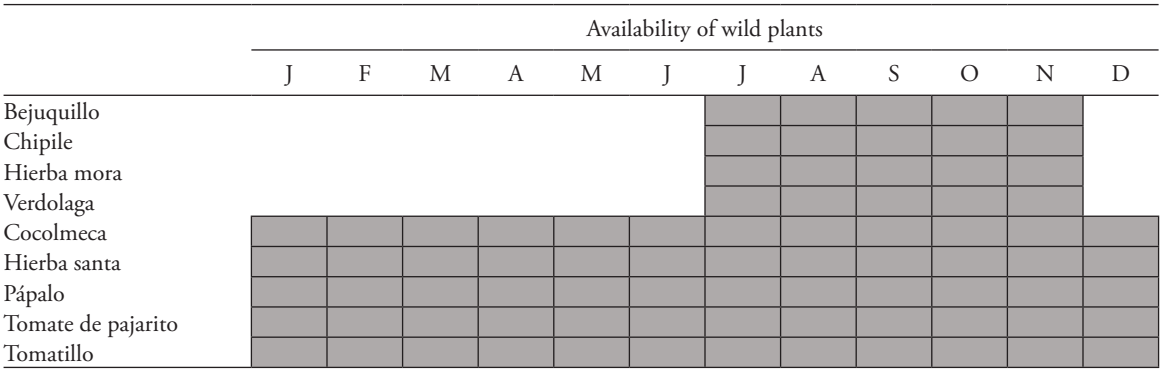


Figure 2. Seasonal availability of collected wild plants.

Table 2. Wild species collected, collectors (men/women) and place of collection in the community of Tecoanapa.

Especies	Families who collect (%)		Collectors				Place of collection					
			Men (%)		Women (%)		Plots (%)		Woods (%)		Market (%)	
	Te*	Xa*	Te	Xa	Te	Xa	Te	Xa	Te	Xa	Te	Xa
Pápalo	100	77	0	68	29	42	76	67	0	29	24	29
Tomate de pajarito	81	87	88	73	12	26	88	70	6	26	6	4
Chipile	62	90	85	79	15	21	69	96	8	0	23	4
Tomatillo	57	39	58	67	42	33	83	58	0	25	17	17
Verdolaga	57	71	42	59	58	41	83	85	0	10	17	5
Bejuquillo	52	13	73	100	27	0	82	50	18	50	0	50
Hierba santa	52	65	64	60	36	40	100	65	0	35	0	0
Hierba mora	19	39	100	100	0	0	100	100	0	0	0	0
Cocolmeca	0	74	0	70	0	30	0	83	0	0	0	17

*Te: Tecoanapa, Xa: Xalpatlahuac.

communities, no pattern was observed, except that the inhabitants of Tecoanapa obtained fewer plants from wild areas, perhaps because they had less access.

In the community of Xalpatlahuac, the nine reported species were collected. The number of families that collected them was greater (Table 2), bejuquillo was only used by 13% of families. Similarly, men were the main collectors and the main source of collection was the garden plot. However, both men and women played an important role in plant collection, which helps ensure food security and a more varied diet. Other studies have shown that women play a more important role in collecting "quelites" (Vázquez-García *et al*., 2004).

Frequency of consumption

Figure 3 shows the number of days per month that collected plants were consumed. The figure shows that in Xalpatlahuac, consumption of collected species was more frequent than in Tecoanapa. Estimation of variability by product was as follows, with the first number referring to the town of Tecoanapa and the second to Xalpatlahuac; chipile: (1.53, 7.84), hierba mora: (0.91, 5.12), cocolmeca: (0, 8.32),tomatillo: (2.61, 12.28),tomate de pajarito: (2.47, 13.88), pápalo: (1.83, 7.2), bejuquillo: (0.56, 0), hierba santa: (0.65, 5),verdolaga: (0.97, 3.24).

In Teconapa, a lower average monthly consumption of collected plants was registered, in terms of families that used them. This locality is the municipal capital, with greater urban development. The families had jobs and a fixed income, with a greater supply of food

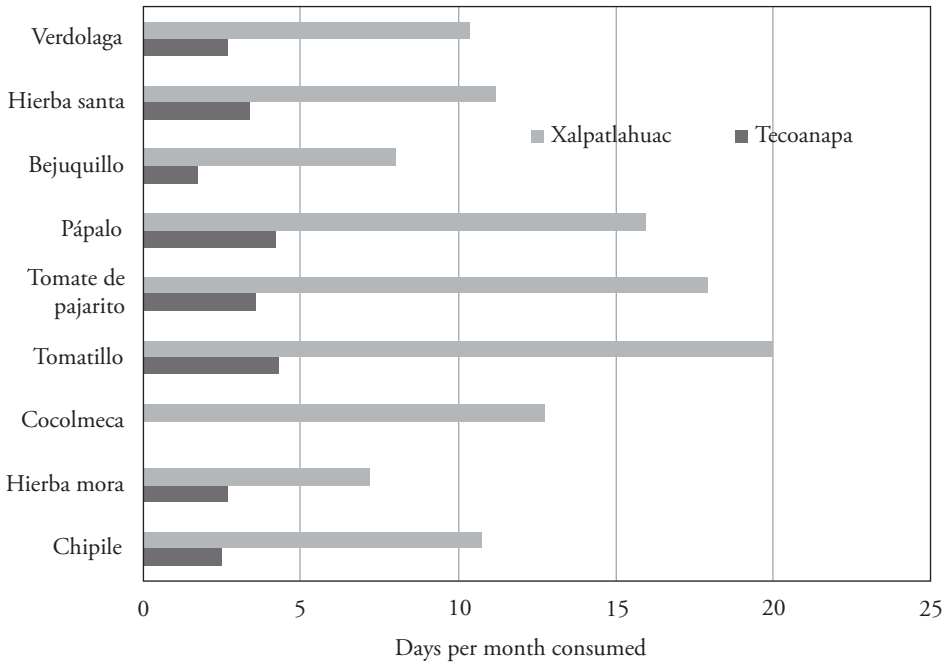


Figure 3. Average monthly consumption of wild plants in the study communities.

products, as well as having less time for farming activities, which can result in changes to eating habits (Lerner and Appendini, 2011). An important outcome was the variation in the frequency of consumption: which was much greater in the more urban town, indicating more diverse eating habits in this situation.

In Xalpatlahuac, these plants were evidently of general interest to those interviewed. On average, those plants available in the rainy season were consumed for 10 days a month; green tomatoes and wild cherry tomatoes are consumed almost daily in sauces. This implies that, during this period, families receive important mineral and vitamin supplements. This coincides with results from Meléndez and Cañez (2009) and Mascorro-de Loera *et al*. (2019). There was a preference for papalo, wild cherry tomato and green tomato. These last two presented greater diversity in terms of transformation and consumption because they can be consumed raw in fresh sauces or as an ingredient for a salad, or they can be consumed following a particular cooking method such as boiling or roasting in the preparation of other dishes.

Until 2017, the federal government implemented the Proyecto Estratégico de Seguridad Alimentaria PESA in the communities of Xalpatlahuac and Tecoanapa. This provided support to family production units in rural localities suffering from high and very high marginalization. The objective was to improve their production capacity; some families benefited from support from this program, for example in the construction of sunny areas on farmland in order to harvest different products. However, impact was limited Secretaria de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación-SAGARPA, 2017. The importance of wild resources for food was not assessed by this program. These species have survived despite the intensification of agricultural systems and are often undervalued; it is necessary to recognize them as a form of identity or food cultural heritage, as Linares and Bye comment (2011), and also as a strategic alternative to strengthen current programs for the promotion of food sufficiency.

In the study communities, as well as in other regions of the country, the collection of uncultivated resources or wild plants improves food quality and security. In a number of rural areas, there is ample knowledge associated with their forms of care, use and transformation into dishes with their own characteristics (Chacón and Gliessman, 1982; Caballero and Mapes, 1985; Vázquez-García *et al.*, 2004; Viesca and Barrera, 2011; Moreira, 2006).

Perspective

The tolerance, protection, collection and use for food and even for medicinal purposes of these species, has ensured their selection, reproduction, maintenance and availability over time (Caballero *et al.*, 1998; Caballero and Cortés, 2001; Casas, 2001; Casas *et al.*, 2014). On occasions, these are undergoing a process of incipient domestication; data related to this were not obtained in this work, but would represent a topic for exploration, in future research.

Despite the role of wild plants for feeding families in the study area, and in other regions of Mexico, their diversity and availability have been reduced in recent years, due to the intensification of agriculture and the use of herbicides. (Vázquez-García *et al*., 2004; Jarvis *et al*., 2007; Mascorro-de Loera *et al*., 2019). In the study area, the use of herbicides has become widespread over the last three decades. All the families with whom we worked in this research used herbicides to reduce the populations of unwanted plants. The most widespread active ingredients are 2-4-D and paraquat, which are used at doses exceeding the technical recommendation (Flores-Sánchez *et al*., 2011). 2-4-D is a selective herbicide for broadleaf species, whereas paraquat is non-selective and results in concentrated residues (Viveros, 2005). For peasant families, the use of this type of product has facilitated the clearing of their land, which is helpful in terms of time and economy, as a single person can do the work of 6 or 7 laborers. Currently, there are some members in these communities who are resuming the cleaning of their land with the tarecua (traditional digging stick instrument) and hoe.

The impact of this phenomenon not only has consequences for biodiversity, but also for gastronomic heritage. It often implies making modifications or adaptations with other ingredients to the original recipes, experimenting with other textures and flavors, as also reported by Viesca and Barrera (2011). Strategies are required that aim to rescue and re-appraise wild edible species, documenting forms of transformation in local gastronomy, investigating and documenting all the resources employed (other plant species, animals in general) used for food as well as factors that determine their being retained or abandoned (Moreira, 2006). In this way, these resources can be assessed and given adequate recognition, as forming a fundamental part of the heritage of the food culture of the rural communities of the Costa Chica de Guerrero. It is necessary to implement programs and research to promote the use, study, dissemination and preservation of these species. This will thus contribute to the reproduction of heritage by favoring the continuity of local gastronomy, the conservation of expertise, and traditional knowledge concerning these plants and food quality.

CONCLUSIONS

Among the plant products grown in the study areas, some are used for home-consumption and surpluses are sold, others are destined for the market, among which hibiscus flower and squash stand out.

Nine wild edible species that were collected by families were identified. Four of the nine species were available in the rainy season and the rest throughout the year; In general, these were food resources, typical of the local gastronomy. There was a difference between the two study communities concerning the consumption of collected plants. Although almost the same species were consumed at both sites, in the Xalpatlahuac community more of these resources were consumed, more frequently and with less variation between families, possibly as the result of being more rural, with fewer opportunities for salaried

income and greater poverty. The population of Tecoanapa municipal capital, where more services and markets were offered, appeared to consume less collected plants.

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