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# ETNOFLORA COMESTIBLE DE LOS TEPEHUANOS DEL SUR DE DURANGO, MÉXICO

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**RESUMEN:** Parte fundamental del patrimonio biocultural mexicano es el conocimiento tradicional sobre plantas comestibles. Actualmente existen avances significativos sobre la documentación de estos recursos a escala nacional; sin embargo, aún existen áreas geográficas y grupos étnicos escasamente estudiados. El objetivo de este trabajo fue sistematizar, analizar y discutir la información sobre plantas silvestres comestibles utilizadas por los tepehuanes del sur de Durango, México. En base a trabajo de campo, reportes técnicos de información etnobotánica y ejemplares de herbario, se generó una base de datos sobre aspectos taxonómicos, ecológicos y etnobotánicos de cada taxa registrado. La información se analizó en términos de composición taxonómica, riqueza, distribución ecológica, formas de manejo y patrones de uso. Adicionalmente, se prepararon sendos listados de especies de plantas silvestres comestibles reportadas en la literatura para los otros tres grupos étnicos principales de la Sierra Madre Occidental con el fin de estimar riqueza y hacer análisis de similitud florística. Para la etnoflora de los Tepehuanes del Sur, se registró un total de 122 especies, 84 géneros y 46 familias. Asparagaceae, Asteraceae, Cactaceae, Fabaceae y Solanaceae representan el 39% del total de especies. Los géneros con mayor riqueza de especies son *Agave* (9), *Opuntia* y *Physalis* (4 cada uno), y *Begonia*, *Dahlia* y *Tagetes* (3 cada uno). Los frutos fueron la parte vegetal registrada con mayor frecuencia; la categoría de alimentos crudos tuvo un mayor número de especies; y la recolección fue la principal forma de manejo. La comparación de esta etnoflora con la de otros tres grupos étnicos de la Sierra Madre Occidental (huicholes, tarahumaras y tepehuanes del norte), sugiere un patrón similar en cuanto a riqueza de especies y composición taxonómica; los resultados del análisis de similitud indican mayor relación de la etnoflora de los tepehuanes del sur con la de los huicholes, sus vecinos más cercanos geográficamente. Este inventario llena un importante vacío de información y es la base del desarrollo de nuevas investigaciones y estrategias para el aprovechamiento y conservación del patrimonio biocultural en Durango.
**Palabras clave:** patrimonio biocultural, Mezquital, *O'dam*, Sierra Madre Occidental, plantas útiles.

**ABSTRACT:** A fundamental piece of the Mexican biocultural heritage is the traditional knowledge about edible plants. There are significant advances in inventorying those resources at country scale; nevertheless, inventories in poorly studied ethnic groups remain greatly incomplete. The aim of this work was to organize,

analyze and discuss information about edible wild plants used by the Southern Tepehuan of Durango, Mexico. Based on field work, unpublished ethnobotanical reports and herbarium specimens, we generated a database that includes taxonomic, ecological and ethnobotanical information. These data were analyzed in terms of taxonomic composition, richness, ecological distribution, management and use patterns. Additionally, separate lists of edible wild plants reported in the literature were prepared for the other three main ethnic groups of the Sierra Madre Occidental and a comparative similitude analysis was carried out. For the Southern Tepehuan ethnoflora, a total of 122 species, 84 genera and 46 families were registered. Asparagaceae, Asteraceae, Cactaceae, Fabaceae and Solanaceae account for 39% of the species. The richest genera are *Agave* (9 species), *Opuntia* and *Physalis* (4 species each), and *Begonia*, *Dahlia* and *Tagetes* (3 species each). Fruits are the part of the plants more used, raw food is the main form of consumption, and simple gathering the main management form. The comparison of this ethnoflora with that of the three other largest ethnic groups of the Sierra Madre Occidental (Huichol, Northern Tepehuan, and Tarahumara) suggests a similar richness and floristic patterns. The similarity analysis results indicate that the edible ethnoflora of the Southern Tepehuans is mainly related with that of the Huicholes, their geographically closest neighbors. This inventory fills an important information gap and is a basis to develop further research and strategies for the use and conservation of the biocultural heritage in Durango.
**Key words:** biocultural heritage, Mezquital, *O'dam*, Sierra Madre Occidental, useful plants.

## INTRODUCTION

Mexico has a vast biocultural heritage (Boege, 2008). It ranks fifth among the 12 megadiverse countries that host around 70% of the world's biological richness (CONABIO, 2017); and also has a great cultural diversity because of the presence of 62 ethnolinguistic groups considered indigenous (Navarrete-Linares, 2008), as well as Mestizos and Afro-descendant groups. An example of the Mexican biocultural richness is the use of 7,461 species of vascular plants (Mapes & Basurto, 2016), 32% of the 22,969 known taxa in the country reported by Ulloa-Ulloa *et al*. (2017).

A fundamental part of Mexican biocultural heritage is the traditional knowledge and use of edible plants. Mapes & Basurto (2016) record 2,168 taxa, including wild and cultivated species, that contribute to the great diversity of traditional Mexican cuisine, which has been considered by UNESCO as intangible heritage of humanity (Iturriaga, 2012; Silva, Lascurain & Peralta de Legarreta, 2016).

The biocultural diversity that characterizes Mexico is clearly represented in the Sierra Madre Occidental (SMO), in the northwest of the country. This mountain range hosts the largest area with temperate forests in the country (González-Elizondo *et al*., 2012), among which the pine-oak (*Pinus* and *Quercus*) forests stand out as the floristic richest vegetation in Mexico (Rzedowski, 1978). Likewise, the SMO hosts an important cultural diversity (Bye, 1995; Nabhan, 2005) with the presence of eight ethnic groups such as Guarijíos, Northern Tepehuan, Pima Bajo, and Tarahumara in Chihuahua state and adjacent areas of Sonora; as well as Cora, Huichol, Mexicanero and Southern Tepehuan at the confluence of the states of Durango, Jalisco, Nayarit and adjacent areas of Zacatecas. Among these ethnic groups stands out the Tarahumara, both by the size of its population and territory, and for being the best studied. The two Tepehuan groups (Northern and Southern) follow in territory and population to Tarahumara, but are far less studied.

### The Southern Tepehuan

Southern Tepehuan (ST) call themselves *O'dam*, which means "those who inhabit" or "people". Their language, like that of the rest of the ethnic groups settled in the SMO, is part of the Uto-Aztecan language family (García-Salido & Reyes-Valdez, 2017). They are called "Southern" to differentiate them from the *Ódami* or Northern Tepehuan, who inhabit in the state of Chihuahua

(Pennington, 1969; Reyes-Valdez, 2006). ST live mainly in Durango state in hundreds of scattered settlements organized in seven ancestral communities; each one of those communities are socially and politically independent, and composed of a religious and political center (main settlement), several *anexos* (medium to large settlements) and a large number of small settlements.

*O'dam* people is a heterogeneous ethnic group regarding language, culture and means of production (González-Elizondo & Ávila-Reyes, 2000). There are at least two linguistic variants: *O'dam* and *Au'dam,* which are geographically separated in part by the Mezquital river canyon (Cramaussel, 2013; Reyes-Valdez, 2006; Sánchez-Olmedo, 1980). In addition, there are also differences among ST communities regarding traditional agriculture and production systems as well as in knowledge and use of wild and introduced plant species.

There are a few studies that points out the importance of traditional knowledge that ST have about biodiversity that help solve some basic subsistence issues, such as food and health (González-Elizondo & Ávila-Reyes, 2000; González-Elizondo *et al.*, 2001; González-Elizondo *et al.*, 2004; Reyes-Valdez, 2006; 2007; Rivas-Vega, Solís-Arellano & Flores-Domene, 2000; Sánchez-Olmedo, 1980).

However, unlike their close neighbors, Huichol and Tarahumara, the ethnobotanical knowledge of ST has been little documented. It is known that ST eat at least 14 species of fungi (González-Elizondo, 1991); nine wild and three cultivated *Agave* species are used as food, medicine, mezcal preparation, fiber extraction, construction material and other traditional uses (González-Elizondo & Galván, 1992); and at least 158 plant species are used for health care purposes (González-Elizondo *et al*., 2001, 2004, 2017; González-Elizondo & González-Elizondo, 1994). There is also documented information about some plants used to make handicrafts and other useful objects (González-Elizondo *et al*., 2017). But, in spite of these advances in the knowledge of Tepehuan ethnoflora, their systematization, analysis and diffusion have been scarce.

Therefore, our objective in carrying out this work was to systematize, analyze and discuss the information about edible wild plants (EWPs) used by the ST that we obtained through field work and that we had documented only in unpublished research reports, as well as in botanical specimens deposited at the CIIDIR herbarium in Durango, Mexico (acronym according to Thiers, 2019). Additionally, a comparative analysis of EWPs used by the four main ethnic groups of the SMO is presented.

## MATERIAL AND METHODS

### Study Area

The territory inhabited by ST (9,380 km$^2$) is among the largest and rugged areas occupied by indigenous peoples in Mexico. It is crossed from northeastern to southwestern by the San Pedro-Mezquital river canyon, and from north to south by the Huazamota river, which, along with the abruptness of the western slopes of the SMO, give this region a rugged topography and a wide elevational range (540-3340 m). Two landscape units or ecoregions of the SMO are present: Madrean and Tropical (González-Elizondo *et al*., 2012) (fig. 1). The first mainly above 2,000 m, with temperate and semi-cold climates, and mainly pine (*Pinus* spp.) and pine-oak (*Pinus* spp. and *Quercus* spp.) forest; the later enters the SMO through the deep canyons on the western flanks, where the elevation ranges from 540 to 2,200 m and is covered mainly by tropical dry forest and subtropical scrub (fig. 2).

This area has been recognized as a center of endemism and high plant diversity (González-Elizondo, 1997; González-Elizondo, González-Elizondo & López, 1997; Toledo *et al*., 2002) and includes part of two of the Terrestrial Priority Regions of Mexico (Arriaga Cabrera *et al*., 2000).

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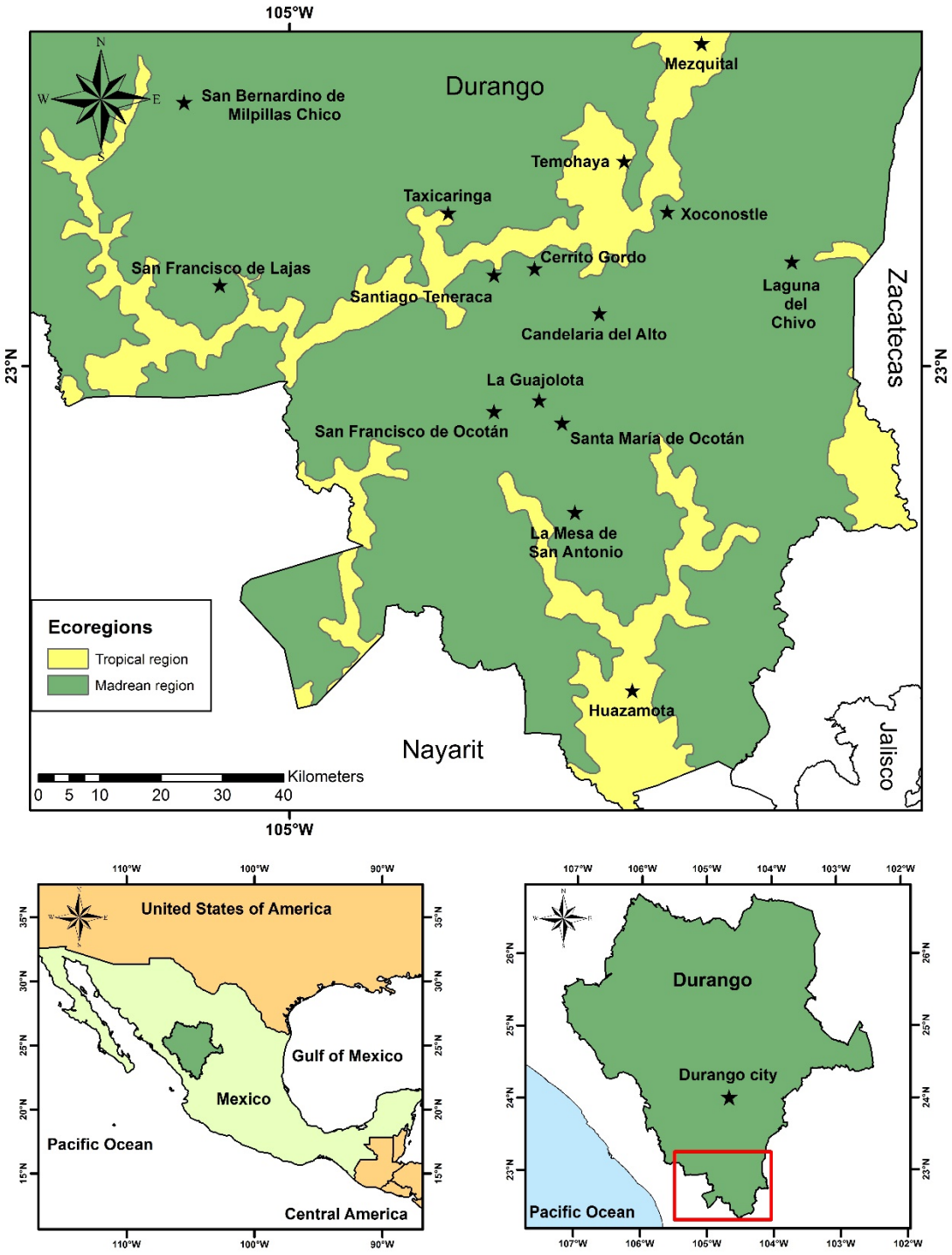


**Fig. 1.** Southern Tepehuan territory in Durango, Mexico.

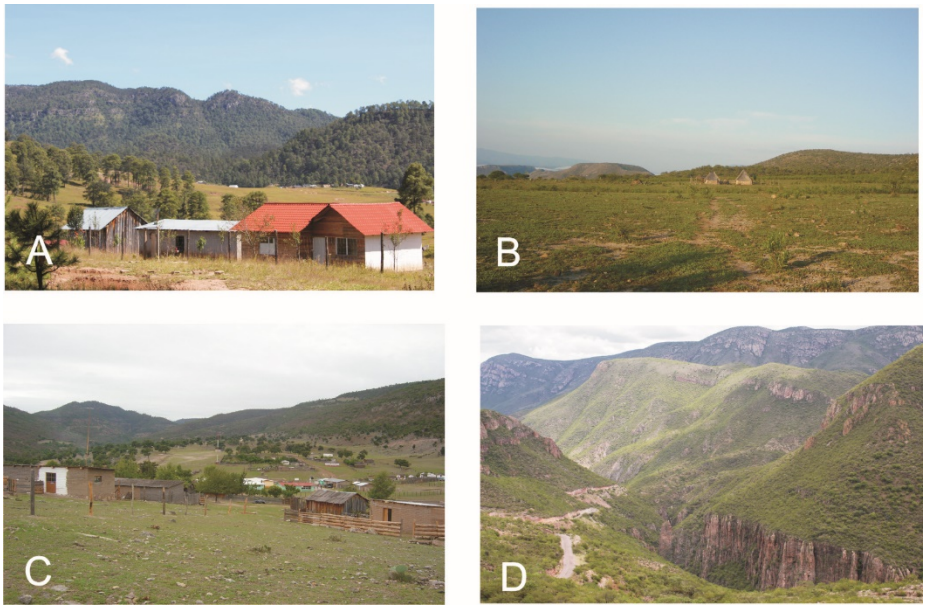


**Fig. 2.** Landscapes of the Southern Tepehuan territory in Durango. A) Madrean ecoregion, Santa María de Ocotán; B) Tropical ecoregion, El Sotolar; C) Madrean ecoregion, Laguna del Chivo; D) Tropical ecoregion, San Miguel de Temohaya. Images: R. E. Narváez-Elizondo (A, D), M. González-Elizondo (B, C).

**Data collection and analyses**

Field work was carried out mainly during summer time from 1982 to 1992. We visited five of the seven ancestral ST communities: Santa María de Ocotán (*Juktir*), San Bernardino de Milpillas Chico (*Mua'lhim*), San Francisco de Lajas (*Aicham*), San Francisco de Ocotán (*Koxbilhim*) and Santa María Magdalena de Taxicaringa (*Muincham*), although most of the data come from the first one and some of its *anexos* such as Candelaria del Alto (*Koba´ran*), Cerro de las Papas (*Yaatuicham*), La Guajolota (*Tobaatam*), Los Charcos (*Susba´ntam*), Laguna del Chivo and Xoconostle (*Nakabtam)*. A few additional ethnobotanical collections and data were collected during the period from September 2017 to November 2018 in Santa María de Ocotán and La Guajolota.

Information about EWPs (e.g. uses, vernacular names both in Spanish and in O'dam language) was obtained through unstructured interviews conducted in Spanish to adult women and men, identified by snowball sampling, and using fresh or dried botanical specimens as visual aids, as well as through participant observation. Besides, collections of plants were carried out through three different methods: 1) collections exhaustively made in a specific area and subsequent interviews to selected informants, 2) collections directed to useful plants with the participation of informants, and 3) collections made directly and individually by the native informants.

Plants collected were processed by conventional techniques and deposited in the CIIDIR herbarium. Taxonomic identification was carried up using specialized literature, and the botanical nomenclature and classification systems were updated following Christenhusz *et al*. (2011) for gimnosperms and Stevens (2001) for angiosperms; for species nomenclature we follow Tropicos (Missouri Botanical Garden, 2019).

In order to determine richness and taxonomic composition of the edible ethnoflora as well as to analyze data, we organized the information in a data matrix in which each row corresponds to species records. The data captured were: taxonomic identity (family, genus, specific epithet, author); common names (in Spanish and in *O'dam* language); edible use categories (raw foods,

cooked foods, alcoholic beverages, non-alcoholic beverages, seasonings and doughs), part(s) of the plant used; life forms; ecoregion where the plant was collected; management form; and main voucher information (collector name and collection number).

Life forms follow the criteria of Frías-Castro, Castro-Castro, González-Gallegos, Suárez-Muro & Rendón-Sandoval (2013), who recognize four categories: trees, shrubs, herbs and vines. Ecoregion(s) inhabited for each species was determined according to the data recorded in herbarium specimens, such as geographical coordinates, elevation and vegetation; in this way each species was registered whether from the Madrean region, Tropical region, or both.

Management categories follow the criteria for wild plants of Caballero, Casas, Cortés & Mapes (1998): a) plants gathered (picked up directly from natural areas) and b) plants with incipient management, which includes those species that are left standing or tolerate during clearings; also, those species whose distribution and dispersion are promoted by anthropogenic actions such as the propagation of seeds or vegetative parts, as well as those protected through the removal of competitors and other forms of care.

Finally, to compare the inventory of EWPs resulting from this work with those reported for the other three largest ethnic groups in the SMO (Huichol, Northern Tepehuan, and Tarahumara), a literature compilation of ethnobotanical information was carried out for each of these three groups, separate lists of edible uncultivated plants were prepared, and its nomenclature and classification system was updated following the same criteria previously mentioned (Stevens, 2001, for angiosperms, Christenhusz *et al*., 2011 for gymnosperms). Richness (total number of species) was estimated for each ethnoflora and the similarity between them at the family and genus level was calculated with the Jaccard index. To visualize the relationships among floras, a dendrogram was produced using the unweighted pair group method with arithmetic mean (UPGMA).

## RESULTS

The EWPs gathered by ST documented in this work comprises 122 species, grouped in 84 genera and 46 families. A summary of the information contained in the database is presented in the Annex 1, arranged alphabetically by botanical family, genus and species name. The richest families are: Fabaceae (13 species), Asparagaceae (11 species), Cactaceae (9 species), Solanaceae (9 species), Asteraceae (7 species), Ericaceae (6 species) (fig. 3) and Lamiaceae (4 species). The richest genera are *Agave* (9 species), *Opuntia* and *Physalis* (4 species each), and *Begonia*, *Dahlia* and *Tagetes* (3 species each).

Herbs are the most used life form (56 species), followed by shrubs (36 species), trees (35 species) and vines (5 species). The edible parts of the plants, from higher to lower frequency are: fruits (52 species), bulbs and roots (28 species), leaves (22 species), stems (21 species), flowers and inflorescences (19 species), seeds (15 species) and resins and sap (6 species) (fig. 4).

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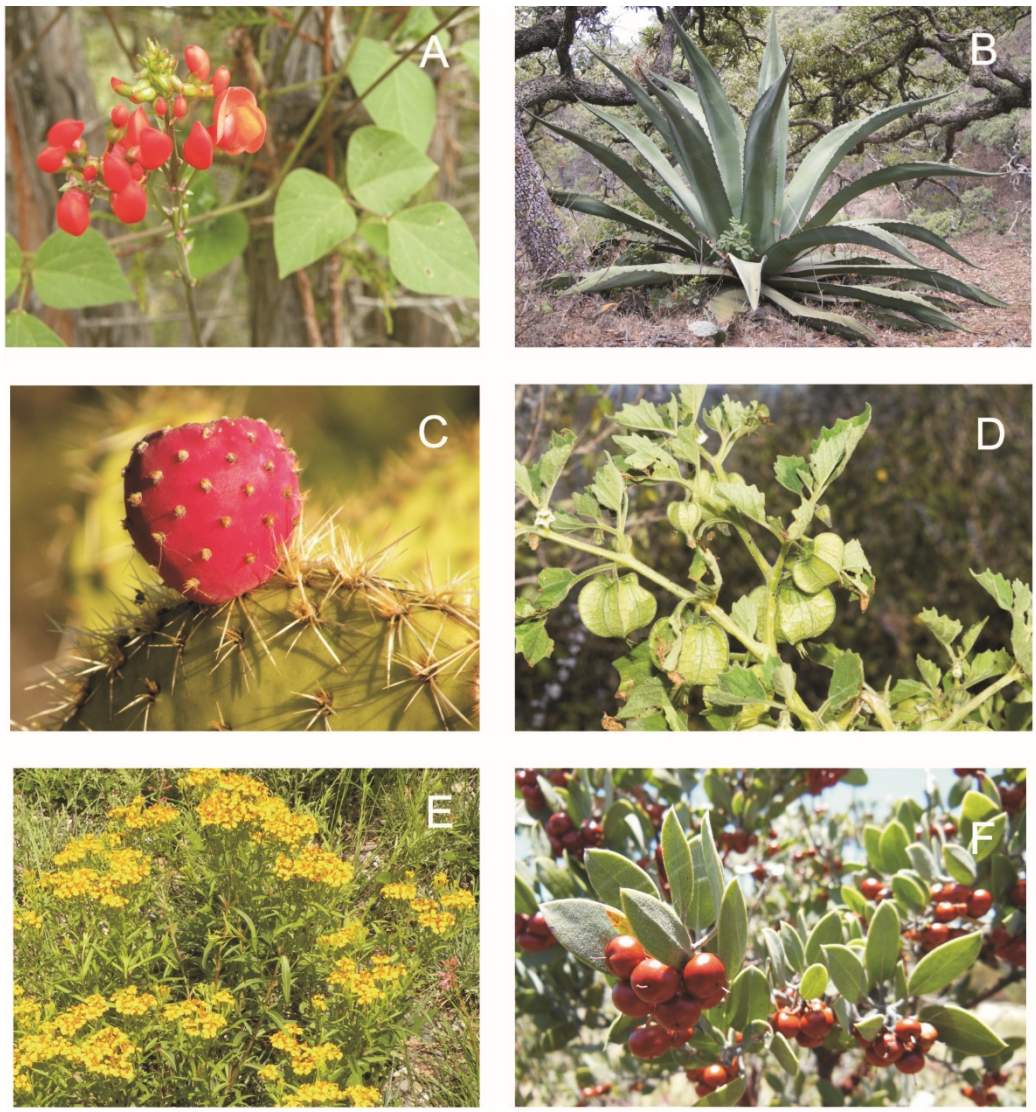


**Fig. 3**. Main families represented in the edible flora of the Southern Tepehuan. A) Fabaceae (*Phaseolus coccineus*), B) Asparagaceae (*Agave shrevei*), C) Cactaceae (*Opuntia* sp.), D) Solanaceae (*Physalis* sp.), E) Asteraceae (*Tagetes lucida*), F) Ericaceae (*Arctostaphylos pungens*). Images: M.S. González-Elizondo (A, B, C, E, F), H. Ávila González (D).


**Fig. 4**. Some edible parts of the plants consumed by the Southern Tepehuan. A) Fruits of pitaya (*Stenocereus queretaroensis*), B) flowers and inflorescences of maguey (*Agave* sp.), C) fruits of tempisque (*Sideroxylon capiri*), D) fruits of oak (*Quercus* sp.). Images: M. González-Elizondo (A), R. E. Narváez-Elizondo (B, D), H. Ávila González (C).

The category of use with the greatest number of species was raw foods (84 species), followed by cooked foods (44 species), seasonings (18 species), non-alcoholic beverages (14 species), alcoholic beverages (6 species) and doughs (4 species).

To prepare non-alcoholic beverages, as infusions, which are taken mainly hot, ST use mainly leaves, but also stems and even roots of some aromatic plants such as *Tagetes* spp., *Scleria bourgeaui* Boeck. and *Ceanothus buxifolius* Willd. Other non-alcoholic beverages prepared from wild plants are taken cool and are made from some fruits (for instance *Rhus aromatica* Aiton and *Pithecellobium dulce* (Roxb.) Benth). Besides, the sap of three *Agave* species, called *aguamiel*, is a sweet drink of pre-Hispanic origin that is very popular throughout Mexico. To make doughs, ST use at least four species (*Chenopodium album* L., *Salvia hispanica* L., *Tripsacum dactyloides* (L.) L. and *Quercus rugosa* Née), whose seeds are crushed and ground mixed with *nixtamal* to make *tortillas*.

In the oral tradition of Tepehuan people, the importance of *Agave* to make *ximaat* (a broth made with the heads of maguey), as well as the use of *Oxalis* spp. and *Begonia* spp. as seasonings of this dish; and the seeds of *Chenopodium album* as a corn supplement to make *tortillas*, are usually cited when they mention a special adverse period of time in which it is said that foods such as corn were very scarce.

Herbs are the predominant life form in general and also by use category, except in the case of alcoholic beverages (table 1), for which six species of *Agave* are used. Fruits, seeds, bulbs and roots are consumed mainly as raw foods; flowers and inflorescences as cooked foods; sap as non-alcoholic beverages; while stems have a great diversity of uses (table 2).

**Table 1.** Number of wild plant species per life form in relation to each category of use of the Southern Tepehuan ethnoflora.

| Life forms | Raw foods | Cooked foods | Alcoholic beverages | Non-alcoholic beverages | Seasonings | Doughs |
|---|---|---|---|---|---|---|
| Herbs | 37 | 21 | 0 | 7 | 15 | 3 |
| Shrubs | 22 | 15 | 6 | 6 | 3 | 0 |
| Trees | 30 | 10 | 0 | 1 | 1 | 1 |
| Vines | 4 | 3 | 0 | 0 | 0 | 0 |

**Table 2.** Number of wild plant species per edible part in relation to each category of use of the Southern Tepehuan ethnoflora.

| Parts used | Raw foods | Cooked foods | Alcoholic beverages | Non-alcoholic beverages | Seasonings | Doughs |
|---|---|---|---|---|---|---|
| Bulbs and roots | 18 | 8 | 0 | 4 | 3 | 0 |
| Flowers and inflorescences | 1 | 12 | 0 | 4 | 4 | 0 |
| Fruits | 47 | 9 | 0 | 3 | 5 | 0 |
| Leaves | 10 | 8 | 0 | 6 | 12 | 0 |
| Resins and sap | 2 | 1 | 0 | 4 | 0 | 0 |
| Seeds | 8 | 8 | 0 | 0 | 0 | 4 |
| Stems | 4 | 9 | 6 | 6 | 6 | 0 |

Considering the diversity of uses as a criteria to estimate the importance value of a plant within a culture, the most important species in this inventory, with four different forms of uses, is *Chenopodium album* L. (raw foods, cooked foods, seasonings and doughs); followed by several species with three forms of use each: *Agave durangensis* Gentry (cooked foods, alcoholic beverages and non-alcoholic beverages), *Dysphania ambrosioides* (L.) Mosyakin & Clemants (raw foods, cooked foods and seasonings), *Oxalis hernandesii* DC. (raw foods, non-alcoholic beverages and seasonings), *Physalis chenopodifolia* Lam. (raw foods, cooked foods and seasonings) and *Pithecellobium dulce* (raw foods, cooked foods and non-alcoholic beverages).

**Ecoregional distribution**

The Madrean region hosts 90 (74%) of the 122 EWPs recorded, while 41 (33%) are from the Tropical region. Nine species (7%) occur in both regions: *Amaranthus hybridus* L., *Ferocactus histrix* (DC.) G.E. Linds., *Lantana camara* L., *Mammillaria* sp., *Opuntia durangensis* Britton & Rose, *Opuntia robusta* H.L. Wendl. ex Pfeiff., *Opuntia* sp., *Portulaca oleracea* L. and *Salvia elegans* Vahl.

**Management forms**

Most of the species (90%) are obtained only through gathering, while for at least 23 species (19%) there are data indicating that also have some degree of incipient management. Some trees and arborescent cactus are left standing during vegetation clearance for its shade or its edible fruits as *Leucaena lanceolata* S. Watson, *Leucaena leucocephala* (Lam.) de Wit, *Myrtillocactus geometrizans* (Mart. ex Pfeiff.) Console, *Opuntia* spp., *Pithecellobium dulce* (Roxb.) Benth., *Prosopis laevigata* (Humb. &Bonpl. ex Willd.) M.C. Johnst., and *Stenocereus queretaroensis* (F.A.C. Weber) Buxb. (fig. 5); all of them, plus *Agave angustifolia* Haw., *Capsicum annuum* L. and *Hylocereus undatus* (Haw.) Britton & Rose are also *ex situ* managed through its cultivation in home gardens either by seed sowing or by planting young plants or vegetative propagules. *Amaranthus hybridus*, *Brassica nigra* (L.) W.D.J. Koch, *Chenopodium album* L., *Dysphania ambrosioides* (L.) Mosyakin & Clemants, *Jaltomata procumbens* (Cav.) J.L. Gentry, *Lycianthes moziniana* (Dunal) Bitter, *Phytolacca icosandra* L., *Portulaca oleracea* and *Solanum nigrescens* M. Martens & Galeotti; all are herbaceous weeds that sometimes are kept during the weeding process because of its edible or medicinal uses. Four species of *Physalis* (*P. angulata* L., *P. chenopodifolia*, *P. philadelphica* Lam. and *P. pubescens* L.) are both kept during weeding and managed *ex situ* through seed sowing.

**Fig. 5**. *Stenocereus queretaroensis* and *Opuntia* sp. that were left standing during vegetation clearance to use its edible fruits. Image: R. E. Narváez-Elizondo.

**Edible ethnofloras comparison of different indigenous groups from the SMO**

The edible ethnofloras compiled for the other three ethnic groups with the greater population and territory in the SMO, besides ST, were 108 species (79 genera and 35 families) for Huichol reported by Nieves-Hernández (2002), 106 species (63 genera and 36 families) for Northern Tepehuan according Pennington (1969) and 143 species (91 genera and 43 families) for Tarahumara, compiling the reports of Bye (1981), Bye *et al.* (1975), Camou-Guerrero (2008), Pennington (1969), and Wyndham (2004). The richest families in each of this three edible ethnofloras were; for Tarahumara: Asteraceae (16 species), Fagaceae (10 species) and Cactaceae (9 species); for Northern Tepehuan: Solanaceae (11 species), Ericaceae and Fagaceae (9 species each); and for Huichol: Fabaceae (13 species), Asteraceae (11 species), and Cactaceae, Ericaceae and Solanaceae (8 species each) (fig. 6).

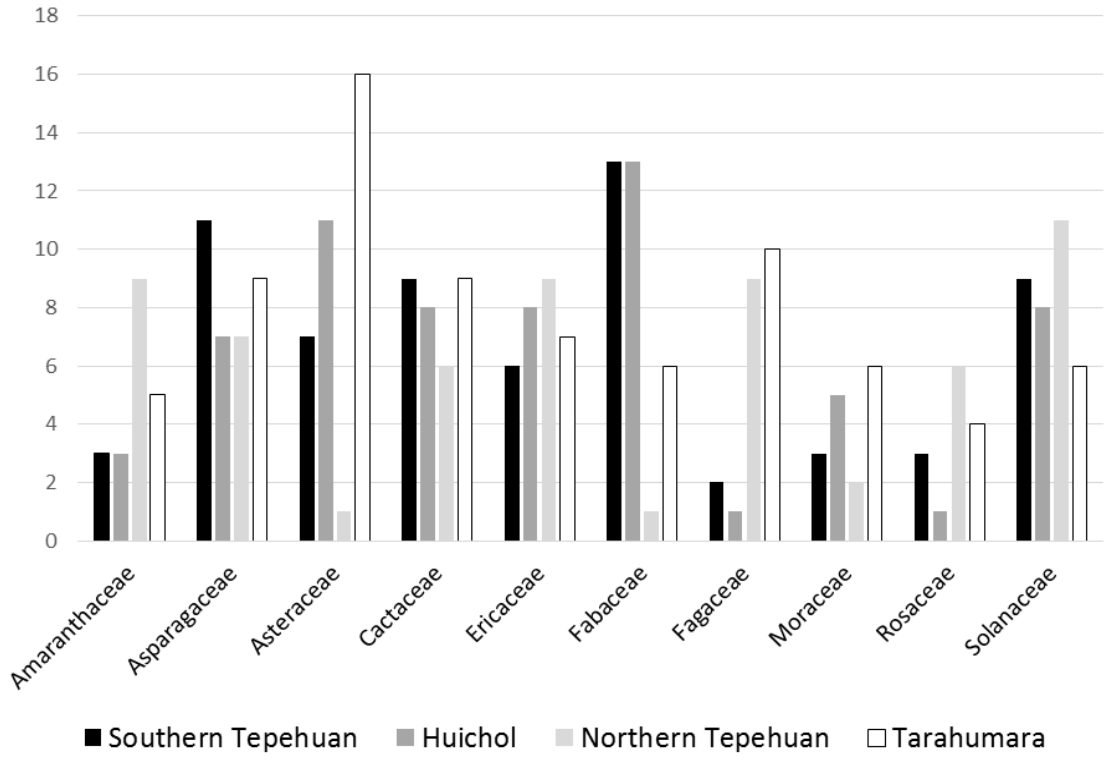


**Fig. 6.** Botanical families with the greater number of edible wild plants among Southern Tepehuan and other three ethnic groups of the SMO. Sources: this work (Southern Tepehuan); Bye *et al.*, 1975, Bye, 1981, Camou-Guerrero, 2008, Pennington, 1969, Wyndham, 2004 (Tarahumara); Pennington, 1969 (Northern Tepehuan); and Nieves-Hernández, 2002 (Huichol).

The total edible ethnoflora compiled for the four ethnic groups (314 species grouped in 176 genera and 65 families) represents 14.5% of the total of edible plants both, wild and cultivated, recorded for the country. According the Jaccard index results, the Tepehuan ethnoflora is more related to the Huichol (62% at the family level and 40% among genera), while the Tarahumara and Northern Tepehuan are more related among them, both in the case of genera (fig. 7A) and families (fig. 7B). Interestingly, the highest difference among the edible ethnofloras was found among Southern and Northern Tepehuans, which share only 46% of the families and 21% of the genera (fig. 7B, 7A).

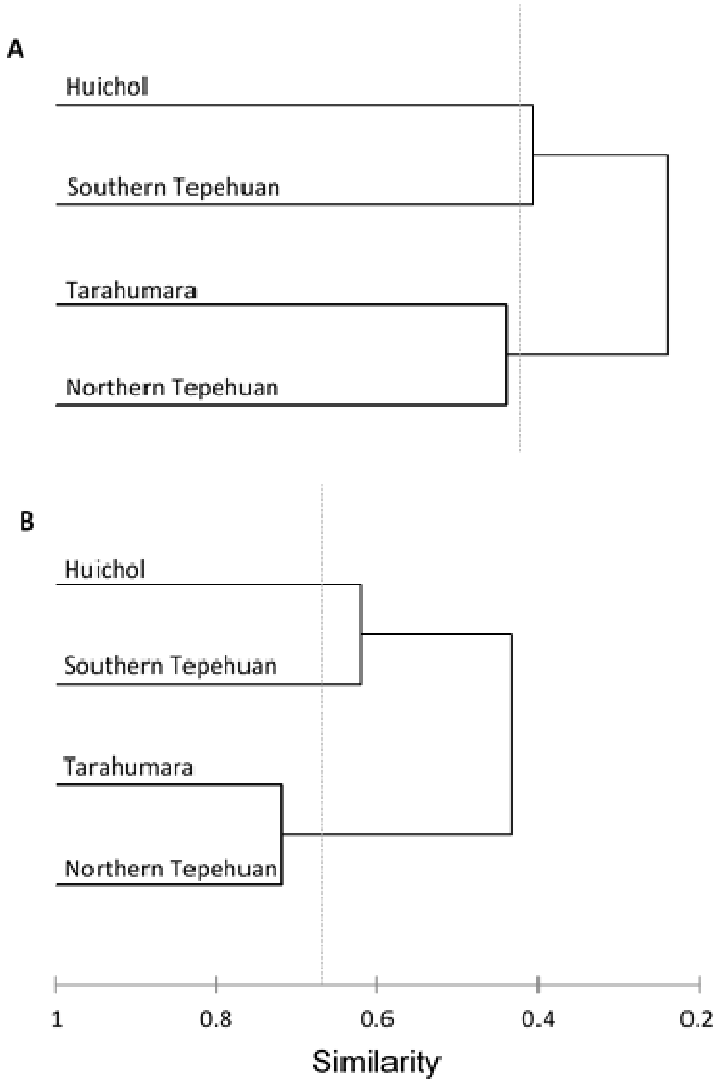


**Fig. 7.** Similarity among Southern Tepehuan ethnoflora and those of three other ethnic groups of the SMO. Dendrograms produced by cluster analysis using UPGMA, based on Jaccard index of similarity: A) Similarity among genera; B) Similarity among families.

## DISCUSSION

**Ethnofloristic richness and uses**

Richness of EWPs in ST ethnoflora is high. It represents around 57% of all WEPs known for Durango state (González-Elizondo, González-Elizondo, López-Enríquez & Herrera-Arrieta, 2017) and 5.3% of the amount recorded by Mapes & Basurto (2016) for edible plants (both cultivated and wild) in the whole country; being those areas respectively 13 and 200 times larger than the territory inhabited by ST. Although richness of EWPs in ST ethnoflora is high, richness of medicinal plants is higher (considering the inventory of González-Elizondo *et al*. (2001). This pattern coincides with that reported by Caballero *et al*. (1998) for the ethnoflora of the whole country. In this regard, Caballero & Cortés (2001) argue that this pattern is related to the variety of diseases (including those of cultural affiliation) and traditional remedies in which one or several species can be used.

As in most of the studies about EWPs from several regions of the world reviewed by Carvalho & Barata, (2016), and in the Mexican ethnoflora (Caballero *et al*., 1998), herbs predominate over trees, shrubs and vines in the ST edible ethnoflora. This pattern may be related to the fact that this life form is associated, in a higher proportion than trees and shrubs, with anthropogenic disturbance areas; where, for its useful properties, the growth of some of them is encouraged (Caballero *et al*., 1998). This could account for the case of ST edible ethnoflora, where 40% of the herbaceous plants grow as weeds or in ruderal habitats.

Raw foods (those consumed fresh or dry without previous actions such as cooking) is the use category that stands out (84 species), being the fruits (47 species) followed by the bulbs and roots (18 species) the parts of the plant more frequently consumed this way. This pattern also coincides with that reported for other ethnic groups in Mexico such as the Otomíes (Ortíz-Quijano, 2007) and even from other parts of the world as South America (Bortolotto *et al*., 2015; Kujawska & Łuczaj, 2015), the Iberian Peninsula (Pardo-de Santayana *et al*., 2007), Estonia (Kalle & Sõukand, 2013), Uganda (Ojelel *et al*., 2019) and Shangri-la, China (Ju, Zhuo, Liu & Long, 2013). Ojelel *et al*. (2019) suggest that the relative importance of wild fruits as food obey, precisely, to the fact that they usually do not require important modifications for their consumption. Furthermore, Weckerle, Huber, Yongping & Weibang (2006) found that, among the edible wild plants, the most consumed parts in Shuiluo Valley (southwest China) are the fruits and leafy vegetables, because it might be easier to collect them than the underground parts; and also that these can be eaten while people are carrying out other activities as hunting and gathering firewood.

In contrast, the category of cooked foods implies previous processes, such as boil or roast in order to soften or modify some of their components through heat changing their taste or other properties; but mainly the cooking process is necessary to make some plants edible, since some of them are toxic if raw. For instance, the white bases of *Agave* leaves are roasted in pits before its consumption, thus this process allows to eliminate high levels of saponins, leaving just a sweet and juicy fibrous mass (Laferrière, Weber & Kohlhepp, 1991).

Unlike raw foods where fruits stand out, among cooked foods the frequency of use of the different parts of the plants does not show much contrast. Even so, the flowers, with 12 species, stand out ligthly over fruits and stems (9 species each), bulbs and roots, leaves and seeds (8 each). The high representativeness of the flowers among the EWPs in ST ethnoflora is related to the use of several species of *Agave* and *Prochnyanthes mexicana* (Zucc.) Rose from which the floral primordia are eaten and represent one of the main gathered food products among this ethnic group (González-Elizondo & Galván, 1992).

The number of species of *Agave* used for the production of mezcal by ST represents 13% of the wild species used for this purpose in Mexico as reported by Torres, Casas, Vega, Martínez-Ramos & Delgado-Lemus (2015). This distilled drink (called *biñ* or *guachicol* in the region) plays an important role in the initiation rituals for young Tepehuan people (Reyes-Valdez, 2006), situation similar to the reported use for tesgüino, another alcoholic drink made from corn (*Zea mays* L. ssp. *mays*) ferments among the Tarahumaras (Kennedy, 1963); as well as during ceremonies in which new traditional authorities are named (Reyes-Valdez, 2007).

Mixing doughs of diferent plants with *nixtamal* is a well known process that has been previously reported (Caballero & Mapes, 1985; Cahill, 2003; Hall, 1976; Hedrick, 1972; Mapes & Basurto, 2016); however, as far as we know, this is the first report of this use for *Tripsacum dactyloides*.

The role of wild plants as supplements or food substitutes during social conflicts of the past, that is pointed out in ST oral tradition about the *ximaat* and that González-Elizondo & Galván (1992) suggest that this adverse time could correspond to the Mexican Revolution period (1910-1917), is also highlighted among other Mexican people such as the *P'urhépecha*

(Caballero & Mapes, 1985), as well as out of Mexico, for example in 1940s in Spain, after the Civil War (Tardío, Pardo-de Santayana & Morales, 2006) and even very recently as in the siege of Sarajevo (1992-1995) during the war in Bosnia and Herzegovina (Redžić, 2010).

Previous work (González-Elizondo, 1991; González-Elizondo & Galván, 1992) as well as past and current field observations indicate that several species of fungi as well as *Agave*, *Leucaena*, some *quelites* (edible greens) and a few roots are the most common gathered food resources among ST. However, a study in process of our research team, suggest that at present the use of EWPs has decreased, or in some cases it has been displaced by elements of western and Mestizo cuisine, although this seems to be less frequent in the most remote settlements with difficult access, where food trade is lower.

**Management forms**

The report of exotic plants in ethnobotanical inventories could be asociated with cultural erosion processes; however, this may also be explained by the diversification hypothesis (de Albuquerque, 2006), which suggests that traditional knowledge about the useful flora of a human group is increased by the incorporation of exotic species. In Tepehuan ethnoflora those are the cases of *Brassica nigra* and *Chenopodium album*, which grow as weedy species with incipient management in agroecosystems and are eaten as *quelites*. Other exotic species reported here are obviously escaped or abandoned plants, as *Annona cherimola* Mill. (from South America) and *Agave americana* L. which is native to the Sierra Madre Oriental and is widely cultivated in Mexico. A similar case is pointed out by Gentry (1982), who comments about some populations of *Agave* found outside their distribution ranges or natural limits; for example, many populations of *Agave salmiana* Otto ex Salm-Dyck in the regions of Puebla, Hidalgo and San Luis Potosí, are derived of old crops. In fact, there is a common name in Tepehuan languaje (*i'gok jiguiarum*, that means wild *i'gok*) for a species of *Agave*, not yet identified, which was reported by some informants and that we suppose could be related with *A. americana* escaped or with wild *Agave salmiana* ssp. *crassispina*; the distribution of the second does not reach the current Tepehuan territory, but there are natural populations in nearby areas, which may be inhabited by the Tepehuan people during the fluctuations of their settlements in the past.

Coinciding with the country level pattern, simple gathering was the main management form; in contrast, the proportion of plants with incipient management (19%) was lower than the reported at the country scale (Caballero *et al*., 1998); where, according to the numbers cited, the EWP with incipient management represents 35% of the ones that are gathered. This could be related to the fact that the greatest effort during our fieldwork was directed to environments with little disturbance; while a pattern has been reported indicating that there is a predominance of the use of species from environments disturbed by man, in comparison with the least disturbed (Signorini, Piredda & Bruschi, 2009). Thus, it is worth to carry out evolutionary ethnobiology studies in ST area in order to distinguish between subtle differences among the incipient management categories (let standing, encouraging growing, protection) proposed in other studies (Casas, Viveros, & Caballero, 1994; Casas *et al*., 2007). For instance, *Byrsonima crassifolia* (L.) Kunth, *Spondias purpurea* L. and *Salvia hispanica* are considered here as gathered (wild) species, and not as incipiently managed. The former two have a wide distribution range throughout the tropical zone of Mexico, are native species that could be for instance protected, but we did not record any form of management of them. The latter used to be an important prehispanic crop that fell in disuse, remaining as a marginal crop during centuries (Cahill, 2003); its cultivation has had a rebound in Mexico during the last decade due to the nutraceutical properties and the numerous nutritional benefits that characterize it and that make it attractive to the market (Xingú-López *et al*., 2017). We found natural populations of *Salvia hispanica* only in ruderal habitats; a particular study on this species would help to clarify if the plants in the study area are relics of old crops.

In addition, it is notorious that more than half (12 of 22) of the species with incipient management recorded here are weed species, suggesting the importance of agroecosystems as sites to get uncultivated resources, and as germplasm banks of wild relatives of cultivated species, which are considered important for food security issues (Fielder *et al*., 2015; Kell *et al*., 2015). Uncertain availability of resources was recorded as the main motivation for the higher management intensity of EWPs in a community in Oaxaca, Mexico (Rangel-Landa, Casas, García-Frapolli & Lira, 2017). The same authors and others have found that edible plants are more prone to be affected by a higher management intensity, in comparison to other forms of use (e.g., medicinal or ceremonial).

**Comparison of edible ethnofloras of different indigenous groups from the SMO**

With 122 species, this inventory of EWPs shows a similar richness that the ethnofloras reported for the other three ethnic groups with the greater population and territory in the SMO: Tarahumara, Northern Tepehuan and Huichol. Also, these four ethnofloras have a taxonomic composition in which the same families stand out (fig. 6).

The greater similarity or affinity between the ethnofloras that make up the two group pairs: ST-Huichol and Tarahumara-Northern Tepehuan, according to their values of the Jaccard index (fig. 7), could be due to the geographical proximity of their territories, since both groups are made up of the closest neighbor of each of its members.

The floristic similarity among the four edible ethnofloras could be related with three factors: 1) the wide distribution range within the SMO of many of the taxa; 2) their intrinsic properties (such as high nutritional values and good taste); 3) a process of cultural diffusion among ethnic groups, both related to their history as part of the Uto-Aztecan language family and their interactions within the SMO. Concerning cultural diffusion, it is worth to note the similarities in the common names of some plants and mushrooms among those groups; for instance, the vocable *mai* is used both in the Huichol language (Torres-Contreras, 2000; Verdín-Amaro & Santos-García, 2012) and in *O'dam* language to name plants of *Agave*, while very similar words (*mái* and *imé*) are the equivalent in the language of Northern Tepehuan and Tarahumara respectively (Bye, Burgess & Mares-Trias, 1975; Pennington, 1969). The same is observed in the vocables to refer to *Opuntia* spp.; in Huichol language the use of the word *nakar* is reported (Torres-Contreras, 2000), which is similar to *nakabh*, the Tepehuan name of *Opuntia robusta*. Likewise, there is similarity in the *O'dam* and Huichol names of some edible fungi (González-Elizondo, 1991; Villaseñor-Ibarra, 1999).

However, cultural diffusion does not always explain the similarities and differences of plant uses between different ethnic groups. In this regard, Pennington (1969) concludes that the cultural pattern about EWPs used by Northern Tepehuan and Tarahumara must have been established many centuries ago, since available evidence indicates that neither group has influenced the other within recent times. This matches the idea pointed out by Carvalho & Barata (2016) "that local use depends more on the cultural importance of each plant, and on the transmission of knowledge and practices needed for using such species than on resource distribution, availability or abundance", since within the ethnobotanical literature has been reported frequently that ethnic groups have quite different food choices although they live in similar environments and share comparable resources availability (Carvalho & Barata, 2016).

On the other hand, some authors (Ali-Shtayeh *et al*., 2008; Moerman, Pemberton, Kiefer & Berlin, 1999) have suggested that the utilitarian importance of a taxon is related to its relative size, for example, its richness and abundance; this could account for the importance of some taxa among ST and other ethnic groups of the SMO. For instance, Fabaceae, Asteraceae, Cactaceae, Lamiaceae and Solanaceae, which are important families in these ethnofloras, also stand out among the 10 most diverse (of a total of 210) in northern Mexico (González-Elizondo, González-Elizondo, López-Enríquez, Tena-Flores, González-Gallegos, Ruacho-González, Melgoza-Castillo, Villarreal-Quintanilla, Estrada-Castillón, 2017) and also among the nine with

the greatest number of useful, and particularly edible species of Mexico (Caballero & Cortés, 2001; Caballero *et al*., 1998). Similarly, *Agave*, a genus which is important for its richness in the four compared edible ethnofloras occupies the eighth place (among 2,854 genera) of Mexico flora (Villaseñor, 2016) and the 16th position (among 1,599) of northern Mexico (González-Elizondo *et al*., 2017).

Besides, although Ericaceae is not counted among the richest families in Mexico, its presence is notable in the temperate forests of the SMO, where 29 species have been recorded, some of them physiognomically dominant associated with *Pinus* spp. and *Quercus* spp. (González-Elizondo *et al*., 2013). Oaks (*Quercus* spp.) are well represented in Northern Tepehuan and Tarahumara ethnofloras (Pennington, 1969); it is another group that stands out for its richness in the flora of Mexico with 174 species (Villaseñor, 2016) and of northern Mexico with 117 species (González-Elizondo *et al*., 2017). Oaks are, with pines, the physiognomic dominant trees in the SMO (González-Elizondo *et al*., 2012). Its little representation in the ST ethnoflora, and their closest neighbors, the Huichol, could be related with the lack of cultural diffusion mentioned above, but also may be the result of insufficient field data. This is very likely in the case of the ST since the ethnoflora presented here results from fieldwork focused mainly in only one of their seven existing communities.

**Importance of edible wild plants**

Consumption of wild plants in some societies has a negative connotation and is associated with poverty and with the lack of ability to buy commercial food, which in turn is perceived as a sign of progress and superior status (Delang, 2006). However, traditional knowledge and use of EWPs is one of the most important approaches in finding solutions to problems such as malnutrition and food security (Grivetti, & Ogle, 2000; Redzic, 2006; Shaheen, Ahmad & Haroon, 2017). In this regard, several studies demonstrate the importance of some taxa reported here, as alternative sources of macro and micronutrients. For instance, leaves of *Chenopodium album* have high contents of vitamin C, carotenoids and fiber (Guil-Guerrero & Torija-Isasa, 1997); fruits of *Hylocereus undatus* contain vitamins C and E as well as lycopene (Mendoza-Mayorga, Salgado-Cortés, Jiménez-Granados, Ortiz-Polo & Ramírez-Moreno, 2018); young pads of *Opuntia* spp. are good source of carbohydrates, calcium and iron (Laferrière *et al*., 1991; Weber, Ariffin, Nabhan, Idouraine & Kohlhepp, 1996); leaves of *Lippia graveolens* contain high values of vitamin C and carotenoids (Rivera, Bocanegra-García & Monge, 2010); tubers of some *Dioscorea* species are richer in proteins and lipids than potato (*Solanum tuberosum* L.) (Guízar-Miranda, 2009); and the mesquite (*Prosopis laevigata*) pod flour has the balanced values of amino acids that FAO recommends as daily intake for adults and kids (Barba De La Rosa *et al*., 2006). Therefore, WEPs are a good source of nutriments; for example, the local importance of functional foods in Granada, Spain has been pointed out by Benítez, Molero-Mesa & González-Tejero (2017).

Collective awareness and action are essential to maintain food resources (Ruelle *et al*., 2019) that can be better options than the processed foods already introduced in rural settlements. Also, documentation and analysis of the traditional knowledge about the use of wild plants and promotion of their knowledge at a local level is particularly crucial in the ST region. Acculturation, combined with the effects of climate change, have resulted in deforestation and other environmental disturbances in this region. Therefore, conservation of the cultural heritage about EWPs of the Tepehuan people may help to nurture pride in their own cultural identity and conserve their natural resources.

## CONCLUSIONS

With 122 species, EWPs known for ST ethnoflora account for 57% of all edible wild flora reported for the entire state of Durango; this may be interpreted as a rich ethnoflora since the area inhabited by ST represents less than 8% of Durango. Also, this inventory is comparable

both in richness and in taxonomic composition with EWPs ethnofloras reported for the three other largest ethnic groups of the SMO (Huichol, Tarahumara, and Northern Tepehuan).

The inventory of this biocultural heritage could be enriched through further surveys focused in the less studied communities of ST ethnic group. It is worth to perform studies about the current state of knowledge and use of EWPs using an intergenerational focus as well as to estimate the current cultural value of each species.

Biodiversity inventories and databases linked to traditional knowledge are fundamental tools for planning strategies and public policies for the sustainable use and conservation of Mexican biocultural heritage.

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**Annex 1.** Edible wild plants used by ST. Categories of use: 1) raw foods, 2) cooked foods, 3) alcoholic beverages, 4) non-alcoholic beverages, 5) seasonings, 6) doughs. Useful part: E) seeds, F) flowers and inflorescences, H) leaves, P) bulbs and roots, R) fruits, S) resins and sap, T) stems. Life form: A) trees, B) vines, H) herbs, T) shrubs. Ecoregion: S) Madrean region, Q) Tropical region. Management form: 1) plants gathered, 2) plants with incipient management.

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| **ASPARAGACEAE** | | | | | | | | |
| *Agave americana* L. | *i'gok* | maguey | 4 | S | T | 1 | S | L. Reséndiz 54 |
| *A. angustifolia* Haw. | *gubuk* | tepemete, mezcalillo | 2, 3 | F, T | T | 1, 2 | Q | L. Reséndiz 55 |
| *A. bovicornuta* Gentry | *sapulh* | | 2, 3 | F, T | T | 1 | S | L. Reséndiz 79 |
| *A. durangensis* Gentry | *ji'ja, kokma mai* | maguey cenizo | 2, 3, 4 | F, S, T | T | 1 | S | L. Reséndiz 84 |
| *A. maximiliana* Baker | *alhii' mai, sapolh* | maguey chico | 2, 3 | F, T | T | 1 | S | M. González 1936 |
| *Agave salmiana* Otto ex Salm-Dyck ssp. *crassispina* (Trel.) Gentry | *i'gok jigiarum* | maguey verde | 2, 4 | S | T | 1 | S | L. Reséndiz 26 |
| *A. shrevei* Gentry | *ji'ja* | maguey cenizo de la sierra | 3, 4 | S, T | T | 1 | S | M. González 1777 |
| *A. vilmoriniana* A. Berger | *biñbui* | amole, lechuguilla | 2 | F | T | 1 | Q | S. González 4090 |
| *A. wocomahi* Gentry | *mai* | maguey | 2, 3 | F, T | T | 1 | S | L. Reséndiz 82 |
| *Nolina* sp. | *umuu', umuu' sapolh* | soyate | 2 | F | T | 1 | S | M. González 3681 |
| *Prochnyanthes mexicana* (Zucc.) Rose | *duiñkar julhiik* | | 2 | F | H | 1 | S | M. González 1400 |
| **AIZOACEAE** | | | | | | | | |
| *Portulaca oleracea* L. | *verdulan, mendola'n* | verdolaga | 2 | H, T | H | 2 | Q, S | A. García A. 2780 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| **AMARANTHACEAE** | | | | | | | | |
| *Amaranthus hybridus* L. | *tukguia'* | quelite | 1, 2 | H | H | 2 | Q, S | R.E. Narváez-Elizondo 86 |
| *Chenopodium album* L. | *kotai, paasui'ch* | epazote | 1,2,5,6 | E, H, T | H | 2 | S | I. Solís 219 |
| *Dysphania ambrosioides* (L.) Mosyakin & Clemants | *paasui'ch, paa'soit* | epazote | 1,2,5 | H, T | H | 2 | S | M. González 1453 |
| **AMARYLLIDACEAE** | | | | | | | | |
| *Allium glandulosum* Link & Otto | *bhan jotkox* | cebollita de campo, cebollín | 1, 2 | P | H | 1 | S | S. González 1288 |
| *A. kunthii* G. Don | *bhan jotkox* | cebolla de coyote | 1, 2 | P | H | 1 | S | M. González 1473 |
| **ANACARDIACEAE** | | | | | | | | |
| *Rhus aromatica* Aiton | *jikdam, kuk'dam* | agrillo, agrito, lantrisco | 1, 4 | R | T | 1 | S | S. González 7747 |
| *Spondias purpurea* L. | *dui* | cirguelillo, ciruelo cimarrón | 1 | R | A | 1 | Q | M. Macías Carrillo 57 |
| **ANNONACEAE** | | | | | | | | |
| *Annona cherimola* Mill. | *chirimoc* | chirimollo | 1 | R | A | 1 | Q | M. González 2261 |
| **APIACEAE** | | | | | | | | |
| *Micropleura renifolia* Lag. | *jikdam* | | 5 | F, H, T | H | 1 | S | M. González 1398 |
| *Tauschia nudicaulis* Schltdl. | *saara'p* | | 2 | F, H, T | H | 1 | S | M. González 1719 |
| **APOCYNACEAE** | | | | | | | | |
| *Matelea pedunculata* (Decne.) Woodson | *saugli, soo'gli* | talayote | 1, 2 | R | H | 1 | S | M. González 1255 |
| **ARECACEAE** | | | | | | | | |
| *Brahea* sp. | *soobolh* | palmillos | 1 | R | A | 1 | Q | M. González 2350 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| **ASTERACEAE** | | | | | | | | |
| *Dahlia coccinea* Cav. | *bar mo', jikamach* | flor de cabeza de guacamaya, jícama | 1, 2 | P | H | 1 | S | M. González 2000 |
| *D. pugana* Aarón Rodr. & Art. Castro | *bar mo'* | jícama silvestre | 1 | P | H | 1 | S | M. González 1260 |
| *D. sherffii* P.D. Sørensen | *bar mo'* | jícama silvestre | 1 | P | H | 1 | S | M. González 1216 |
| *Sinclairia palmeri* (A. Gray) B.L. Turner | *kuptuna* | jícama silvestre | 1 | P | H | 1 | S | M. González 3484 |
| *Tagetes filifolia* Lag. | *yubat* | yerbanís, anís | 4, 5 | F, H, P, T | H | 1 | S | I. Solís 410 |
| *T. lucida* Cav. | *yubat* | yerbanís | 4 | F, H, T | H | 1 | S | M. González 1461 |
| *T. micrantha* Cav. | *tanoolh yooxi'* | anisillo, anís | 4 | F, H, P, T | H | 1 | S | I. Solís 346 |
| **BEGONIACEAE** | | | | | | | | |
| *Begonia gracilis* Kunth | *jikdam, subhaa'n jikdam* | limón de sapo | 1, 5 | H | H | 1 | S | S. González 6261 |
| *B. sandtii* Houghton ex Ziesenh. | *jikdam, subhaa'n jikdam* | limón de sapo | 1, 5 | H | H | 1 | S | M. González 1434 |
| *B. tapatia* Burt-Utley & McVaugh | *jikdam, subhaa'n jikdam* | limón de sapo | 1, 5 | H | H | 1 | S | M. González 1425 |
| **BRASSICACEAE** | | | | | | | | |
| *Brassica nigra* (L.) W.D.J. Koch | | mostaza | 1, 2 | H | H | 2 | S | M. González 1035 |
| **BROMELIACEAE** | | | | | | | | |
| *Pitcairnia karwinskyana* Schult. & Schult. f. | *jamch* | | 1 | P | H | 1 | S | M. González 2309 |
| *P. palmeri* S. Watson | *jamch* | | 1 | P | H | 1 | S | M. González 1915 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| **CACTACEAE** | | | | | | | | |
| *Ferocactus histrix* (DC.) G.E. Linds. | *silistus, tilistos* | biznaga de acitrón | 1, 2 | R, T | T | 1 | Q, S | M. González 1262 |
| *Hylocereus undatus* (Haw.) Britton & Rose | *sa'sparak iibhai* | tasajo | 1 | R | T | 1, 2 | Q | M. González 2345 |
| *Mammillaria* sp. | *silistus* | | 1 | R | T | 1 | Q, S | |
| *Myrtillocactus geometrizans* (Mart. ex Pfeiff.) Console | *garambur* | garambullo | 1, 2 | F, R | A | 1, 2 | Q | M. González 1275 |
| *Opuntia durangensis* Britton & Rose | *nab* | nopal duraznillo | 1, 2 | R, T | T | 1 | Q, S | M. González 4377 |
| *O. robusta* H.L. Wendl. ex Pfeiff. | *nakaab, ji ñaboo* | nopal tapón | 1 | R | T | 1 | Q, S | M. González 4375 |
| *O. tomentosa* Salm-Dyck | *nab* | chamacuero | 1 | R | A | 1 | Q | D. Ramírez 3166 |
| *Opuntia* sp. | *joi'siilh, nab* | nopal | 1, 2 | R, T | T | 1, 2 | Q, S | H. Ávila 917f |
| *Stenocereus queretaroensis* (F.A.C. Weber) Buxb. | *gisulh* | pitayo | 1 | R | A | 1, 2 | Q | M. González 1194 |
| **CAPRIFOLIACEAE** | | | | | | | | |
| *Valeriana edulis* Nutt. | *xixcabulh* | chichamole | 2 | P | H | 1 | S | S. González 5533 |
| *V. pratensis* (Benth.) Steud. | *xixcabulh* | chichamole | 2 | P | H | 1 | S | M. González 1390 |
| **CISTACEAE** | | | | | | | | |
| *Helianthemum glomeratum* (Lag.) ex DC. | *takarii yooxi', kokma' yooxi'* | hierba de la gallina | 4 | H, T | H | 1 | S | S. González 1545 |
| **CONVOLVULACEAE** | | | | | | | | |
| *Ipomoea bracteata* Cav. | | jícama | 1 | P | B | 1 | Q | S. González 2401 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| *I. capillacea* (HBK.) G. Don | *jukú, juk sai, i'pur sar ni gam, gujuk yooxi'* | naguas de mujer, chinita | 1 | P | B | 1 | S | S. González 6253 |
| **CYPERACEAE** | | | | | | | | |
| *Cyperus esculentus* L. | *tirik sai, sai'* | coquillo, zacate, pasto coquillo | 1 | P | H | 1 | S | S. González 4673 |
| *Scleria bourgeaui* Boeck. | *jakrr* | | 4 | H, T | H | 1 | S | S. González 3581 |
| **DIOSCOREACAE** | | | | | | | | |
| *Dioscorea* sp. | *yalh* | camote de la sierra | 2 | P | B | 1 | Q | I. Solís 1282 |
| **ERICACEAE** | | | | | | | | |
| *Arbutus arizonica* (A. Gray) Sarg. | *okdham, ok'yam* | madroño, m. rojo | 1 | R | A | 1 | S | S. González 2661 |
| *A. xalapensis* Kunth | *bii kar* | madroño | 1 | R | A | 1 | S | S. González 5194 |
| *Arctostaphylos pungens* Kunth | *yolhim, uxbik* | manzanilla, pingüica | 1 | R | T | 1 | S | S. González 1703 |
| *Comarostaphylis polifolia* (Kunth) Zucc. ex Klotzsch | *siindaak* | madroñito, pingüico | 1 | R | T | 1 | S | I. Solís 19, 131, 747 |
| *Gaultheria glaucifolia* Hemsl. | *tutkulh* | capulín | 1 | R | T | 1 | S | M. González 1726 |
| *Vaccinium stenophyllum* Steud. | | manzanita | 1 | R | A, T | 1 | S | S. González 8393 |
| **FABACEAE** | | | | | | | | |
| *Cologania broussonetii* (Balb.) DC. | *motaguis* | | 1 | P | H | 1 | S | I. Solís 330 |
| *C. pulchella* Kunth | *motaguis* | | 1 | P | H | 1 | S | I. Solís 300 |
| *Eriosema palmeri* S. Watson | *motaguis, moo'ta'cch, toxcol yahlí* | | 1 | P | H | 1 | S | M. González 1534 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| *E. pulchellum* (Kunth) G. Don | *mo'takix* | guayabillo | 1 | P | H | 1 | S | S. González 7051 |
| *Hymenaea courbaril* L. | *kalpush* | guapinole | 1 | E | A | 1 | Q | R. Rivas 4 |
| *Inga eriocarpa* Benth. | *kolhim* | vainillo | 1 | E | A | 1 | Q | S. Acevedo 188 |
| *I. hintonii* Sandwith | *soa-gim, coa-gim* | vainillo | 1 | E | A | 1 | Q | M. González 2341 |
| *Leucaena lanceolata* S. Watson | *nakualh* | guaisillo | 1 | H | A, T | 1, 2 | Q | M. Macías Carrillo 30 |
| *L. leucocephala* (Lam.) de Wit | *nakualh, guash* | guais | 1, 2 | E | A, T | 1, 2 | Q | M. Macías Carrillo 32 |
| *Phaseolus coccineus* L. | *basik bhabik* | frijolillo | 1, 2 | F, R, E | B | 1 | S | I. Solís 56 |
| *Phaseolus* sp. | *basik bhabik* | frijolillo | 1, 2 | F, R, E | B, H | 1 | Q | M. González s.n. |
| *Pithecellobium dulce* (Roxb.) Benth. | *gidhai* | guamúchil | 1, 2, 4 | R | A | 1, 2 | Q | M. Macías Carrillo 31 |
| *Prosopis laevigata* (Humb. & Bonpl. ex Willd.) M.C. Johnst. | *bio'* | mezquite | 1 | R, S | A | 1, 2 | Q | M. Macías Carrillo 29 |
| **FAGACEAE** | | | | | | | | |
| *Quercus crassifolia* Humb. & Bonpl. | *ka'bulhik tua'* | encino | 2 | E | A | 1 | S | M. González 2229 |
| *Quercus rugosa* Née | *tua'* | encino | 2, 6 | E | A | 1 | S | R.E. Narváez-Elizondo 76 |
| **GROSSULARIACEAE** | | | | | | | | |
| *Ribes ciliatum* Humb. & Bonpl. ex Roem. & Schult. | | ciruelillo, capulincillo | 1 | R | T | 1 | S | M. González 1664 |
| **HYPOXIDACEAE** | | | | | | | | |
| *Hypoxis mexicana* Schult. & Schult. f. | *sapo'ke, sapo'qui* | | 1 | P | H | 1 | S | M. González 1751 |
| *H. potosina* Brackett | *sapo'ke, sapo'qui* | | 2 | P | H | 1 | S | M. González 1708 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| **IRIDACEAE** | | | | | | | | |
| *Tigridia dugesii* S. Watson | *kusar, kuusa'r* | | 1 | P | H | 1 | S | M. González 2015 |
| **JUNCACEAE** | | | | | | | | |
| *Juncus dichotomus* Elliot | *toba ja'ki* | | 1 | R | H | 1 | S | M. González 1714 |
| **LAMIACEAE** | | | | | | | | |
| *Hedeoma patens* M.E. Jones | *bho'mkox origan* | orégano de techalote | 5 | H | H | 1 | S | M. González 1492 |
| *Salvia elegans* Vahl | *bibiatam yooxi'* | | 1 | F | T, H | 1 | Q, S | M. González 1662 |
| *S. hispanica* L. | *bayalh* | chía | 1, 6 | E | H | 1 | S | M. González 1555 |
| *Vitex mollis* Kunth | *ibar* | gualamo, uvalamo | 1 | R | A | 1 | Q | M. González 3153 |
| **LAURACEAE** | | | | | | | | |
| *Litsea glaucescens* Kunth | *upchi'ulh, yurel* | laurel | 5 | H | A, T | 1 | S | M. González 2506 |
| **MALPIGHIACEAE** | | | | | | | | |
| *Byrsonima crassifolia* (L.) Kunth | *nanchis* | nanches | 1 | R | A, T | 1 | Q | I. Solis 640 |
| **MALVACEAE** | | | | | | | | |
| *Ceiba aesculifolia* (Kunth) Britten & Baker f. | *korpos* | pochote, carpus | 2 | E | A | 1 | Q | M. Macías Carrillo 15 |
| *Guazuma ulmifolia* Lam. | | guácima, guazuma | 1 | R | A | 1 | Q | M. González 2563 |
| **MORACEAE** | | | | | | | | |
| *Brosimum alicastrum* Sw. | *jɸhl* | capomo | 2 | E, R | A | 1 | Q | M. Macías Carrillo |
| *Ficus cotinifolia* Kunth | *book ilhdha'* | camichin | 1 | R | A | 1 | Q | M. Macías Carrillo 67 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| *F. crocata* (Miq.) Miq. | *book ɨlhdha'* | chalate, salate | 1 | R | A | 1 | Q | M. González 2265 |
| **MYRTACEAE** | | | | | | | | |
| *Psidium guajava* L. | *uxhka ru'* | arrayán | 1, 2 | R | A, T | 1 | Q | M. González 2525 |
| **ORCHIDACEAE** | | | | | | | | |
| *Oncidium graminifolium* (Lindl.) Lindl. | *ish jp, shp, kaisuk, ka'suk* | | 1 | P | H | 1 | S | I. Solís 868 |
| **OROBANCHACEAE** | | | | | | | | |
| *Escobedia peduncularis* Pennell | *azaprán* | azafrán | 5 | P | H | 1 | S | M. González 1368 |
| **OXALIDACEAE** | | | | | | | | |
| *Oxalis corniculata* L. | *jɨkdam, jucur* | agrito, limoncillo | 1, 5 | H, T, F | H | 1 | S | M. González 1375 |
| *O. hernandesii* DC. | *jɨkdam, yicur* | limoncillo | 1, 4, 5 | H, P, T, F | H | 1 | S | M. González 1376 |
| **PHYTOLACCACEAE** | | | | | | | | |
| *Phytolacca icosandra* L. | *mantabach, bhantabax* | cóngora | 2 | H | H | 1, 2 | S | M. González 1385 |
| **PINACEAE** | | | | | | | | |
| *Pinus cembroides* Zucc. | *juk* | pino piñonero, piñonero real | 1, 2 | E | A | 1 | S | M. González 3627 |
| *P. maximartinezii* Rzed. | *juk* | piñon | 1 | E | A | 1 | S | S. González 7742 |
| **POACEAE** | | | | | | | | |
| *Tripsacum dactyloides* (L.) L. | *tarai juun* | maíz de pájaro corredor | 1, 6 | E | H | 1 | S | I. Solís 78 |
| **RHAMNACEAE** | | | | | | | | |
| *Ceanothus buxifolius* Willd. | *suudalgam, sudolhgam* | guasapol, guasapole | 4 | P | T | 1 | S | S. González 1699, 7067 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| **ROSACEAE** | | | | | | | | |
| *Fragaria vesca* L. ssp. *Bracteata* (A. Heller) Staudt | | fresa, fresa silvestre, fresilla | 1 | R | H | 1 | S | M. González 1802 |
| *Malacomeles psilantha* (C.K. Schneid.) B.L. Turner | | mimbre, mirto de la sierra | 1 | R | T | 1 | S | M. González 2158 |
| *Prunus serotina* Ehrh. | *tutkulh* | capulín, capuliña | 1 | R | A, T | 1 | S | M. González 1450 |
| **RUBIACEAE** | | | | | | | | |
| *Chomelia barbata* Standl. | | manzanilla negra | 1 | R | A, T | 1 | S | M. Macías Carrillo 110 |
| *Crusea longiflora* (Willd. ex Roem. & Schult.) W.R. Anderson | | | 1 | R | H | 1 | S | J. Mendía 132a |
| *Genipa americana* L. | *solhii, soslhi* | tapuz | 1 | R | A | 1 | Q | M. Macías Carrillo 59 |
| **RUTACEAE** | | | | | | | | |
| *Casimiroa edulis* La Llave & Lex. | *jobii'ñ* | zapote z. blanco, chapote | 1 | R | A | 1 | S | M. González 2266 |
| **SAPOTACEAE** | | | | | | | | |
| *Sideroxylon capiri* (A. DC.) Pittier | *haix* | tempisque | 2 | R | A | 1 | Q | M. Macías Carrillo 7 |
| *S. persimile* (Hemsl.) T.D. Penn. | | güencho, cupilla | 1 | R, S | A | 1 | Q | M. González 2152 |
| **SOLANACEAE** | | | | | | | | |
| *Capsicum annuum* L. | *pulhiix* | chile quipín, chile piquín, chilito | 2, 5 | R | T | 1 | Q | M. González 2541 |
| *Jaltomata procumbens* (Cav.) J.L. Gentry | *tutkulh* | tomatillo, jaltomata | 1 | R | H | 2 | S | M. González 1426 |
| *Lycianthes moziniana* (Dunal) Bitter | *duiibhar, duibar* | | 1 | R | H | 2 | S | M. González 1378 |

| Taxa | Tepehuan name | Spanish name | Category of use | Useful part | Life form | Management form | Ecoregion | Voucher |
|---|---|---|---|---|---|---|---|---|
| *Physalis angulata* L. | *tomialh soo's pocagl* | tomatillo | 2, 5 | R | H | 2 | S | R.E. Narváez-Elizondo 90 |
| *P. chenopodifolia* Lam. | *tomialh soo's pocagl* | tomatillo | 1, 2, 5 | R | H | 2 | S | M. González 1042 |
| *P. philadelphica* Lam. | *co'soosfocagl, so'osfocagl* | tomatillo | 2, 5 | R | H | 2 | S | M. González 1427 |
| *P. pubescens* L. | *tomialh soo's pocagl* | tomatillo | 2, 5 | R | H | 2 | S | M. González 1455 |
| *Solanum nigrescens* M. Martens & Galeotti | *tutkulh* | hierba mora, mora, capulín | 1, 4 | R | H | 2 | S | M. González 2623 |
| *Solanum stoloniferum* Schltdl. | *yaatui* | papa cimarrona | 2 | P | H | 1 | S | M. González 1946 |
| **VERBENACEAE** | | | | | | | | |
| *Lantana camara* L. | | | 1 | R | T | 1 | Q, S | I. Solís 633 |
| *Lippia graveolens* Kunth | *origan* | orégano, oreganillo | 5 | H | T | 1 | Q | S. González 7120 |
| **XIMENIACEAE** | | | | | | | | |
| *Ximenia parviflora* Benth. | | ciruelilla | 1 | R | T | 1 | S | M. González 3682 |