ETHNOBOTANICAL SURVEY OF MEDICINAL PLANTS USED IN ZACATECAS, MEXICO

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Introduction

- On average, 90% of the population in developing countries is relying on medicinal plants as their primary health care system.
- The medicinal plants used by communities across all of Mexico have an important role and more than half of the population still heal their ailments with medicinal plants (1).
- It is estimated that the Mexican medicinal biota contains approximately between 3000 to 5000 plant species with a therapeutic potential. Unfortunately, only a low number of medicinal plants (approximately 1000 plants) have been thoroughly studied in their properties (2, 3).
- The present study was conducted in the semi-arid area of northern Mexico, where research on the biodiversity in Zacatecas state is rather limited, not well developed and undocumented (4,5).
- Reviews of plants deposited in the herbarium of Zacatecas demonstrated a high amount of local flora with possible medicinal use. The herbarium is composed of 522 species distributed in 299 genera and 97 families (6). However, there are no in-depth ethno medicinal field studies to date.

Objectives

- The main objectives of the study were the preservation of medicinal uses and the recording and cataloguing of medicinal plants in 40 communities of Zacatecas.

Figure 1.- Visit the communities and interview with the local people

1 To identify, document and create a botanical inventory of plants used with medicinal purposes.

Materials and Methods

-The survey was conducted in Zacatecas state, Mexico **(Fig. 2)**

-The population of Zacatecas is 59% urban and 41% rural. The main industries are agriculture (7.48%), mining and manufacturing (45.35%), and tourism (47.16%). The number of inhabitants is 1,579,209 (808,841 women and 770,368 men).(7)

-The percentage of the population living in moderate to extreme poverty is 52.3% (7,8).

Study Area

The state represents 3.84% of Mexico.

The clime is characterized by a semiarid climate.

The average of Temp17 °C. And Precip. 510 mm

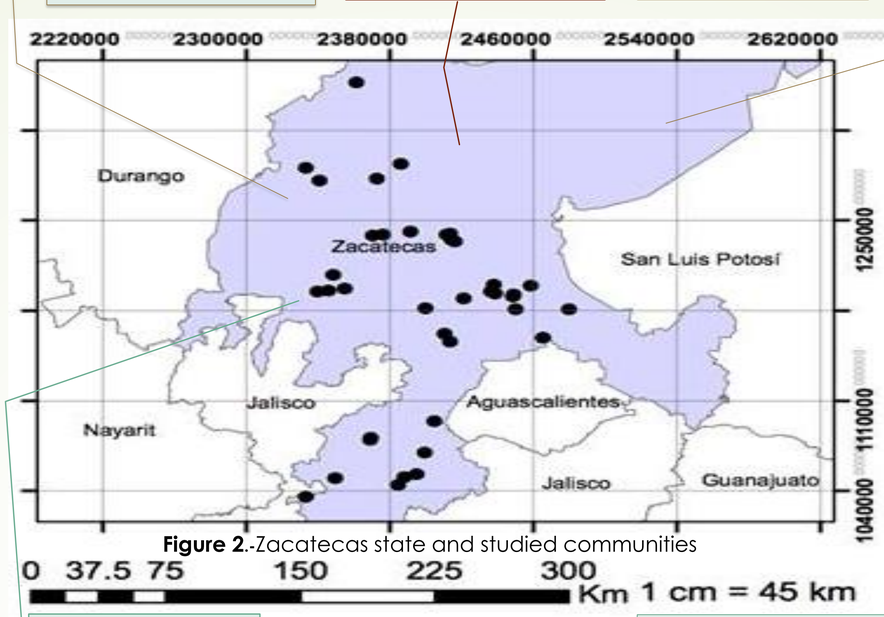
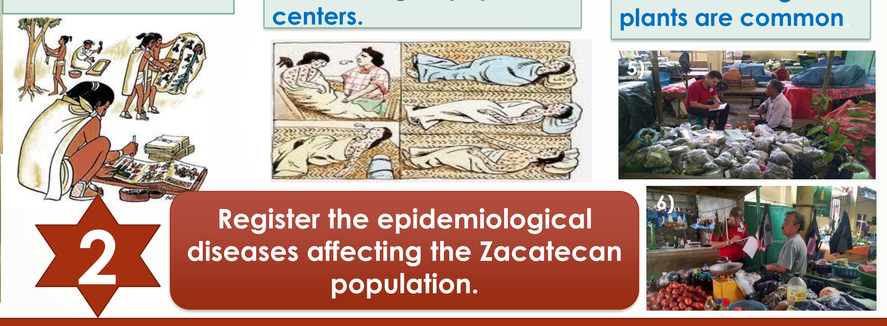


Figure 2.-Zacatecas state and studied communities

Traditional medicine is widely found in those communities.

Hospitals and medical services are not regularly available in areas outside of the larger population centers.

The presence of small herbal stores and a variety of useful indigenous plants are common.



2 Register the epidemiological diseases affecting the Zacatecan population.

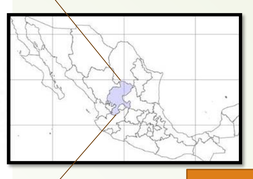
Data Collection

-The field work was carried out in 40 communities across the state from January to October 2016 **(Fig. 2).**

-Sampling of the informants was based on the snowball method in order to find people with experience using plants (9).

-There were many visits to the study area in order to collect specimens. The samples were pressed and taxonomically identified with the aid of Biblioteca Digital de la Medicina Tradicional Mexicana (www.medicinatradicionalmexicana.unam.mx/index.php) in cooperation with the Department of Agronomy and the Herbarium of the Autonomous University of Zacatecas).

Sample: 132 informants were interviewed



-123 local residents
-9 specialists

-Informants were between the ages of 20-86 ($\bar{X}$=49) **(Tab.1)**

Data Analysis

-Medicinal plants were identified taxonomically.

-Data was analyzed and tabulated using standard quantitative indices such as Relative frequency of citation (RFC)(10,11), Family importance value (FIV), Cultural importance index (CI)(12), Relative Importance Index (RU)(13)and Informant consensus Factor (ICF)(14).

-The information was structured in the form of Use-Reports (UR, the informant i, mentions the use of species s in the use category u) (15).

-Plants were categorized into 12 ailment categories.

3 Quantitavely analyze the medicinal uses and determine the most used plants in the communities.

Results

-Results show that 96.3% of the informants are actively using traditional medicine to solve health problems and as a complementary treatment for chronic diseases.
-The traditional knowledge found in the area was mostly used for post-delivery issues, gastrointestinal and respiratory problems **(Tab. 2)**.
-Age and gender parameters did not display any significant differences in medicinal knowledge(F:0.043, M:0.039).

Table 1.-Socioeconomic information

Demographic variable	Demographic category	Number of informants	%
Gender	Female	82	49
	Male	86	51
Age	20-30	15	9
	31-40	25	15
	41-50	45	27
	51-60	49	29
	Above +61	34	20
Residence Location	Rural	88	53
	Sub-urbs	80	47
Occupation	House wives	54	41
	Farmers	20	15
	Public workers	9	7
	Traders	17	13
	Profesors	5	4
	Students	2	2
	Labourers	11	8
	Other activity	13	10
Public health insurance	Insured	139	83.4
	Uninsured	29	16.6

This practice is co-evolving with the modern health system due to lack of accessibility and perceived low effectiveness of conventional medicine.

-A total of 99 human ailments were divided into 12 categories **(Tab. 2)** based on the International Classification of Diseases used by the World Health Organization (17).
-A total of 168 medicinal species belonging to 151 genera and 69 botanical families were documented.

Table 2.-Ailments categories, informant consensus Factor(ICF) and use report (UR)

No	Ailments category	ICF	No of species	UR	UR %
1	Diseases of the reproductive system	0.81	17	86	6.53
2	Diseases of the digestive and gastrointestinal system	0.80	67	329	24.96
3	Diseases of the Respiratory system	0.79	54	257	19.50
4	Diseases of the musculoskeletal	0.78	29	130	9.86
5	Diseases of the nervous system.	0.74	15	55	4.17
6	General symptoms	0.69	52	168	12.75
7	Diseases of the urinary tract system	0.67	30	89	6.75
8	Diseases Chronic - Degenerative	0.63	15	39	2.96
9	Auto-immune diseases	0.60	5	11	0.83
10	Diseases of the Cardiovascular system.	0.58	28	66	5.01
11	Diseases of the skin	0.58	36	85	6.45
12	Antidotes	0.00	3	3	0.23

Figure 3.-Plant part used (%)

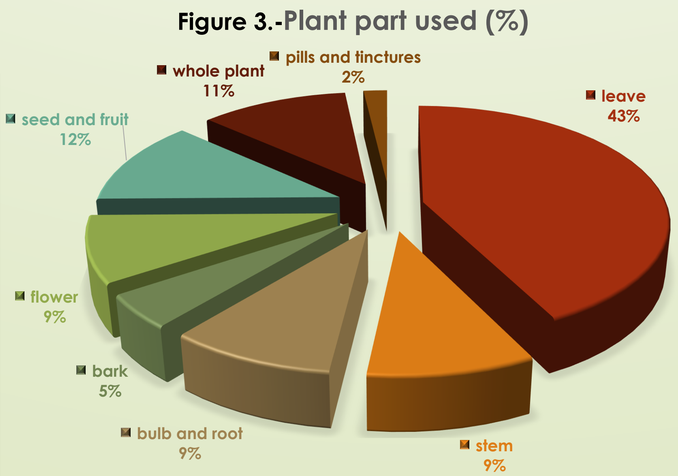
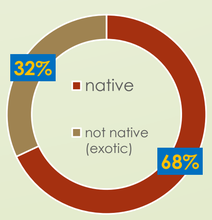


Figure 4.- Plants origin (%)



-The family Asteraceae (20 species; FIV=15.15) represented the highest number of species.
-The majority of herbal remedies are used orally and predominantly in the form of infusion (52%).
-The preparation methods were mainly freshly harvested and directly processed parts (44% of cases), 27 % was from dried plants, and the remaining were mixed (dried and fresh with more plants **(Fig. 3)**(68% of the plants are native)**(Fig. 4)**.
-The most culturally important species was *Matricaria chamomilla* L., followed by *Arnica montana* L. and *Artemisia ludoviciana* Nutt **(Tab. 3)**.
-This is the first explorative and analytic study based on quantitative tools dealing with the relative importance of medicinal plants in the semi-arid region of Zacatecas, México.

Table 3.-Ranking of 15 most culturally important medicinal species according to the quantitative measures

Scientific name	Use reports	No. of informants	CI	RFC	RI
Matricaria chamomilla L.	140	0.38	1.15	0.55	0.73
Arnica montana L.	62	0.28	0.49	0.39	0.66
Mentha x verticillata L.	55	0.23	0.48	0.27	0.51
Aloe vera (L.) Burm.f.	53	0.11	0.46	0.23	0.71
Ruta chalepensis L.	51	0.04	0.44	0.27	0.62
Gnaphalium sp.	35	0.27	0.42	0.27	0.36
Artemisia ludoviciana Nutt.	48	0.05	0.36	0.32	0.48
Eryngium heterophyllum Engelm.	40	0.07	0.30	0.13	0.31
Larrea tridentata (Sessé & Moc. Ex DC.) Coville	33	0.08	0.26	0.15	0.54
Origanum vulgare L.	31	0.08	0.23	0.14	0.25

Conclusion

The problems most often treated using the plants are post-delivery complications. Knowledge about the uses of the plant was not homogenous in the area, the growing and marketing of medicinal plants are still not controlled or regulated. The users are still obtaining the plants from wild sources, causing a degradation and exhaustion of the plants available

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