

Chapulixtle's (*Dodonaea Viscosa*) knowledge and management in a region of Mexican Subtropics



Geography

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ABSTRACT

Chapulixtle is a cosmopolite plant, it grows and develops in diverse geographic, ecological and environmental conditions. It predominates in deciduous tropical forests, associated to oak forests, secondary communities, shrubs, successive forests, mesophilous vegetation, gullies, spaces exposed to direct sunlight, mountainsides, deteriorated grasslands, eroded soils, over-grazed spaces, abandoned cultivation zones, and fire-struck areas. Dodonaea viscosa is a plant multifunction, it is used and managed by peasant families from a region of Mexican Subtropics. The research instrument was applied to 1000 individuals to demonstrate its importance, multifunction and peasants' knowledge. A database was integrated and through descriptive statistics proportions were calculated. Fieldwork and trips for the region were fundamental. This plant has significantly contributed to peasant families' economy, and has diverse uses and functions: ecological, environmental, agriculture, medicinal, as fuel, ornamental, housing construction (domestic), agriculture-forest, ceremonial and reloading aquifers.

Introduction

Chapulixtle (*Dodonaea viscosa*) is an evergreen woody shrub; its leaves are sessile, brilliant, fine textured and covered in resin. This plant grows up to five meters; It naturally grows and develops in most of the Mexican climates, in diverse kind of soils (including eroded ones), and preferably where sunlight is direct. The Geographic conditions where it grows and develops do not determine its spatial distribution, since it is found at different heights above sea level. It is considered that it can live from sea level to 2600 m.a.s.l. (Rzedowski, 2001).

The edaphic component does not condition or determine chapulixtle's growth, for it has been seen in soils with peculiar characteristics. Camacho et al, (1993) point out that chapulixtle shrubs grow in a wide soil variety, including the superficial, rocky and with steep slopes. They can be found alone or in association with other vegetal species, mainly diverse families of *Quercus*, for in these ecosystems chapulixtle finds ecological and environmental conditions for its growth and development. This plant tolerates both semi-arid climates and sub-humid, preferably with winter drought, it seems as though humid climates with rains along the year are not favorable for it. Easily adaptable to high temperatures and daily and seasonal oscillations, moreover, it bears light frosts. In respect to precipitation, chapulixtle is located in areas with ranges from 200 mm to 800 mm, it requires a well-defined summer season and places with sunlight incidence (Camacho et al., 1993). Chapulixtle is a cosmopolite plant, since it is easily adaptable to diverse climates.

Method

In order to demonstrate the multifunction of chapulixtle in Mexico a field research was carried out from January 2013 to December 2015 in a region of Mexican subtropics. A research instrument was structured where three observation and measurement: chapulixtle's knowledge, utilization and magnitude of chapulixtle's uses, and preservation issues linked to care and handling of the plant. The research instrument was applied to a sample of a thousand individuals older than six years of age, who resident rural zones in the region, so as to learn the knowledge and handling level the population has of the plant. A database was integrated and through descriptive statistics proportions were calculated.

Results

The region of study is located in the Mexican Republic between 18° 21' and 19° 34' north latitude and 99° 16' and 100 ° 36' west longitude. Heights vary between 400 and 3500 m.a.s.l. s. The region has a total surface of 8285.06 km², conformed by a wide variety of landscapes, environments and human settlements. It has

a total population of 797 493 inhabitants.

Chapulixtle is a multipurpose plant, as each of its parts is used in different ways and with different ends, it is also notorious that while farming society uses the leaves for some diseases' treatment, another uses the twigs to agriculture process.

Table 1. Chapulixtle's (*Dodonaea viscosa*) knowledge and management. n = 994

Knowledge of the plant	Frequency	%
Women older than 6	452	45.5
Men older than 6	542	54.5
Plant's usage		
Women older than 6	458	46.1
Men older than 6	536	53.9
Usage of the parts of the plant		
Root	159	15.9
Stem	985	99.0
Twigs	878	88.3
Leaves	672	67.6
Flowers	321	32.2
Fruit	138	13.8
Seed	245	24.6

Knowledge of the plant is greater in men

(54.5 percent), this can be due to the fact that men are those who have more contact with the region's environment and agriculture activities. Likewise, it is this group the one which more frequently uses the plant (53.9 percent).

Agriculture use	Frequency	%
Tool manufacturing	973	97.8
Tutors manufacturing	985	99.0
Huts for fruit protection	237	23.8
Medicinal use		
Skin diseases	451	45.3
Arthritic diseases	536	53.9
Stomach diseases	349	35.1
Venereal diseases	139	14.0
Postpartum diseases	982	98.7
Oral and respiratory diseases	239	24.0
Domestic use		
Fuel	783	78.7
Housing	321	32.3
Farming subsistence	418	42.0
Ornamental use		
Rural housings' gardens	127	12.8
Orchards' protection	157	15.8

Urban public spaces	5	0.5
Environmental use		
Reforestation	138	13.9
Soil and water preservation	192	19.3
Environmental restoration	113	11.4
Ecological use		
Ecological restoration	125	12.6
Soil formation and vegetal coverage	148	14.9
Ceremonial use		
December festivity	672	67.5
Social events	259	26.0
Fireworks (rod)	102	10.2

The most utilized parts of the plant, in descending order, are: stem (99.0 percent), leaves (67.6 percent) and flowers (32.2 percent); being the parts with the lesser usage seeds, roots and fruit. In the case of stems, they are basic for the handling of irrigated cultivations, construction, tool manufacturing, fireworks and as fuel.

In relation to the plant usage, seven are the main functions in the region: agriculture, medicinal, domestic (fuel, housing, peasant subsistence), ceremonial, environmental, ornamental and ecological.

Agriculture functionality. Chapulixtle in several regions of Mexico is important for agriculture, since the conditions of the wood's hardness, its stems and twigs are used to produce tutors in horticultural cultivations (Linares, 1992 y Juan, 2013). The stems and twigs are used as tutors or supporters of the tomato plant, so as the fruit does not rot with water and preserves from insects and parasitic plants. This use is the most important in the region. Likewise, twigs are used to manufacture agriculture tools.

In the region, chapulixtle has three specific uses in agriculture: a) as tutors in tomato, green tomato and chili cultivations; b) manufacturing of tools and reinforcing of baskets for strawberry collection; and c) construction of huts, locally called "ranchos" to protect the harvested agriculture products from sunlight. The most frequent agriculture use is the manufacturing of tutors (99 percent) and to the manufacturing of tools (97.9 percent). Other usage linked to agriculture is the construction of rustic huts where harvested fruits are temporary stored in order to prevent them from dehydration (23.8 percent).

Table 2. chapulixtle's (*Dodonaea viscosa*) usages in the region of Mexican Subtropics n = 995

Medicinal functionality. Chapulixtle has medicinal properties and it is used to alleviate sufferings from rheumatism and waist aches, its leaves are used for parturient women. It has haemostatic (it controls hemorrhages), astringent and diaphoretic properties.

Anibal, (1986) mentions that the infusion of *Dodonaea viscosa* is used for the treatment of fever, colic, toothaches and throat infections. Due to its cicatrizing characteristics it is used in the treatment of wounds and insect bites. In the region, chapulixtle's medicinal use is one of the most important, since 98.7 percent of the women in reproductive age utilize chapulixtle and other medicinal plants in order to avoid problems in the feminine reproductive apparatus. 53.9 percent of the population —men and women— older than 35 years of age use chapulixtle prepared with other parts of plants and substances; in lesser proportions it is used for the treatment of skin infections (45.3 percent) and stomach ailments (35.1 percent). The greatest frequency of chapulixtle use for the treatment of diseases corresponds to women. Traditional medicine is important in the region, as it helps to solve health problems, mainly in places where there are not medical services or accessibility to them is not easy (Juan et

al., 2010; Juan, 2013; Juan, 2014).

Domestic functionality. Up to the 1940's chapulixtle's twigs and stems worked in the rural environment to construct bajareque walls (ensembles of interwoven twigs covered in flattened mud). In some communities from the eastern region where families with scarce economic resources there are still houses made of chapulixtle interwoven twigs, tied with palm strings and, other of bajareque, mainly in the kitchen.

Peasant families' economy has been favored by chapulixtle's usage, for its recollection to manufacture tutors and its commercialization among agriculturists generates monetary resources which help farming familial economy (Juan et al., 2010; Juan, 2014). Forty-two percent of the sample complements its familial subsistence by means of manufacturing tutors for cultivations. Other benefits for peasant families is this plant's use as fuel (78.7 percent), this is because many a families in the countryside still use firewood as fuel.

Ornamental functionality. The establishment of chapulixtle plantations to create hedges in urban zones (urban dasonomy) is important, due to its undemanding conditions of soil and water (Camacho et al., 1991). It is a plant with a high ornamental potential, since it resists droughts and adapts to different kinds of soil, even those which undergo eroding processes (Camacho y Bustillo, 1988). The ornamental use in the region is not significant. 15.8 percent of the interviewed people declared having chapulixtle plants at home, mainly as protection fences from the spaces where there are other useful vegetables for the family.

Environmental functionality. Chapulixtle resists strong winds, drought and cold weather. Because of its characteristics chapulixtle is easy to be propagated and produced in nurseries and greenhouses; moreover, it is useful to establish plantations in areas where environmental impact is significant (Oliveira and Camacho, 1992). It survives in rock formations and eroded soils as well as in those deteriorated by diverse factors. Due to the characteristics of adaptation to deteriorated environments, this plant can provide benefits and be useful in environmental restoration programs.

In the region environmental use of chapulixtle is of little significance, although the inhabitants know the benefits this plant provides the ground with, 13.9 percent of the surveyed people stated having planted chapulixtle in cultivation fields' bordering zones, this as a measure to deter eroding processes and favor water infiltration. 11. 4 percent of the inhabitants have planted chapulixtle in eroded soils as strategy to recover them.

Ecological functionality. Being chapulixtle a plant that adapts and survives in different environments —both natural and deteriorated— develops ecological functions; in oak fields restoration it is irreplaceable because it can be oak's support, which in its early life requires soft soil, shade, fallen leaves and plenty of water, which *Dodonaea viscosa* captures and holds in abundance, hence contributing to feed the phreatic layers. Due to fallen leaves abundance it is a plant that contributes to degraded soil recovery as well as their formation (Oliveira y Camacho, 1992).

In environments deteriorated by natural or socio-cultural factors such as eroding processes, fires, uncontrolled grazing, clandestine chopping of trees, quarry, plagues and forest problems, as well as abandoned fields; chapulixtle is a multipurpose plant, efficacious in ecological restoration programs, for it has the capacity to rapidly make successive vegetation populations, under minimal conditions of soil and water requirements. Similarly to the functions above stated, chapulixtle can be used in ecological restoration actions, since between both processes there are interactions which make recovering environments deteriorated

by wrong handling of natural resources, extractive activities or pollution possible. 14.9 percent of the inhabitants in the sample commented having used chapulxitle's twigs to control the water flow in irrigation channels.

The regions' characteristic soils are deciduous tropical forest, evergreen tropical forest and low rainforest, where human action has caused an impact, so several peasants (12.6 percent) have begun activities which favor the increment of forestal layer and soil formation. Hence, the ecological restoration of the mentioned ecosystems is also fostered.

Ceremonial functionality. There are not ceremonial or ritual uses of chapulxitle reported in other countries or in Mexico. Nevertheless, recent studies carried out by Juan et al, (2010) show this plant has ceremonial, religious and social uses in seven localities of the region. 67.5 percent of the inhabitants use this plant's.

Scarce economic resources' families use the chapulxitle's twigs that have leaves and flowers as well as other wild flowers, proper to the region, as adornment for religious images and tables in social events. 26.0 percent of the families of the studied sample use the plant for this purpose. In the religious celebrations and festivities of some communities of the region, the people who set temporary business use the twigs of chapulxitle to make arcs, thus embellishing the space.

Most frequent functionality in the region corresponds to agriculture activities, followed by medicinal functionality to treat diseases. The functionalities with the lesser frequency correspond to the ecological, ornamental and environmental ones, these last possibly because of the space where the study was performed is eminently rural.

Conclusions

The region of the southern State of Mexico (Mexican Subtropics) has a wide variety of landscapes determined by the interaction and interrelation of environmental, ecological, biological, topographic, geologic, geo-morphologic, climatic, hydrographic and socio-cultural factors.

Chapulxitle (*Dodonaea viscosa*) in Mexico and particularly in the Mexican Subtropics is a multipurpose plant; it is mainly used by peasant societies devoted to seasonal and irrigated (commercial cultivations) agriculture. The main usages are the agriculture and medicinal. It is the country and region's farming societies' culture what allows the inhabitants to acknowledge the environment's biotic and non-biotic components as well as search for a wide variety of usages, goods and services for each one of them.

Socio-cultural conditions of the human groups in Mexico influence the diversity of uses of *Dodonaea viscosa*, as the researches performed by biologists, agriculture engineers, forestal engineers and agro-ecologists show the plant's functionality and its vindication at national level. In the warm climate zone 22 different uses were found, and it is most probable that in the arid zones of the country there is some other.

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