

# ETHNOBOTANY OF HELIOPSIS LONGIPES (ASTERACEAE: HELIANTHEAE)

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## Abstract

*Heliopsis longipes* known as chilcuague is a perennial herb endemic to Sierra de Álvarez and Sierra Gorda, where the States of San Luis Potosí, Guanajuato and Querétaro converge, and its root has traditional uses. However, there is a lack of studies that document the current traditional uses within its entire distribution area. The objectives of this research were to determine the traditional forms of use of chilcuague, and to determine the current demand of its root. Gathers, merchants, and consumers in traditional markets (tianguis) in San Luis Potosí, Guanajuato and Querétaro were interviewed. The root of chilcuague is economically and culturally important. It has diverse traditional uses and its sale is practiced all year-long at the traditional markets of San Luis de la Paz, Dr. Mora, and San José Iturbide, Guanajuato; Rioverde and San Ciro, San Luis Potosí; and Jalpan, Querétaro. Chilcuague is used against parasites by adding roots over food. Moreover, a correlation with age of informants and knowledge of the uses of the plant was found. A higher amount of dried roots of chilcuague were sold in places with more traditional uses.

Key words: chilcuague, parasites, traditional uses, Sierra Gorda

## Introduction

The long-standing relationship between humans and plants has generated diverse knowledge about plant resources, explaining why some plants have become important to the global economy. However, economically important wild plants generally lack sufficient information about their distribution, habitat conservation status, population studies, ecological requirements, and traditional uses (Gálvez and de Ita, 1992). *Heliopsis longipes* S.F. Blake is a perennial herb endemic to the region that includes portions of the Sierra de Álvarez and the Sierra Gorda, where the states of San Luis Potosí, Guanajuato, and Querétaro converge (Figure 1) (Little, 1948 a, b). The common names of this plant include chilcuague, pelitre, raíz de oro (golden root), and raíz azteca (Aztec root) (Ramírez, 1902; Santamaría, 1959; Martínez, 1967). Within the genus, *Heliopsis longipes* is the most economically important species (Fisher, 1954); in addition to its recognized insecticidal and medicinal properties, its root is used as a condiment in sauces, stews, and alcoholic beverages (Martínez, 1967). In traditional

medicine, it is used to relieve muscle and tooth pain, as well as for deworming and as an insecticide (Little, 1948b; Martínez, 1967).

The use of chilcuague has involved the total destruction of the plant, leading to a decrease in the populations of this species and its disappearance in some areas (Little, 1948b; Molina-Torres and García-Chávez, 2001). Chemical studies (Jacobson, 1954; Jacobson, 1955; Domínguez et al., 1958; Molina-Torres et al., 1995; Molina-Torres et al., 1996; García-Chávez et al., 2004) and pharmacological studies (Johns et al., 1982; Romero et al., 1989; Gutiérrez-Lugo et al., 1996; Molina-Torres et al., 1999; Ramírez-Chávez et al., 2000) have been conducted on the root of *H. longipes*. However, there are no recent studies documenting the current state of its traditional uses and economic importance within its natural distribution area.

For these reasons, the objectives of this work were to document the current traditional uses of *H. longipes* and to understand the current demand for its root in the regions where it is distributed.



**Figure 1:** Known geographical distribution of *Heliopsis longipes*.

## Materials and Methods

### Recording of Ethnobotanical Information:

To gather traditional knowledge about *H. longipes*, questionnaires were developed for people involved in the knowledge and use of chilcuague, such as gatherers, merchants, and users (Montes and Aguirre, 1994). The interviews were conducted on market days in nine traditional markets in the states of San Luis Potosí, Guanajuato, and Querétaro, located within and around the known natural distribution area of *H. longipes*. The interviews were open-ended but based on the questionnaires prepared for the different groups, which facilitated the exchange of information.

The merchants interviewed (n=23) were experienced in selling chilcuague. The gatherers (n=2) were farmers engaged in collecting this plant for sale; these gatherers were selected based on the criteria proposed by Hernández and Ramos (1977), meaning they were the gatherers with the most experience in collecting this root. The users interviewed (n=15 in each of the nine markets) were people who purchased chilcuague and demonstrated knowledge of the uses or properties of this plant. The interviews were conducted from February to November 2004, during market days in the various markets surveyed. The uses of chilcuague and the number of mentions of these uses were recorded to calculate the frequency of root use in the region.

### Current Demand for Chilcuague Root in the Region:

Based on the questionnaires directed at gatherers and merchants, the units of chilcuague sold (bundles), the weight and unit price, points of sale, the season, and frequency of sales in each of the markets visited were recorded. Using the data obtained, estimates were calculated to determine the annual volume, price per kilogram, and annual value, similar to the Ethnobotanical Importance Value used by Vargas et al. (1994), using the following equations:

$$\text{Annual volume} = \frac{\text{bundles sold in one market day} \times \text{bundle weight (g)} \times 4 \times 12}{1000 \text{ g}}$$

Where:

4 = number of market days per month

12 = months in a year

g = grams

Price per kilogram =

$$\text{bundle weight (g)} \times \text{sale price} / 1000 \text{ g}$$

Annual value =

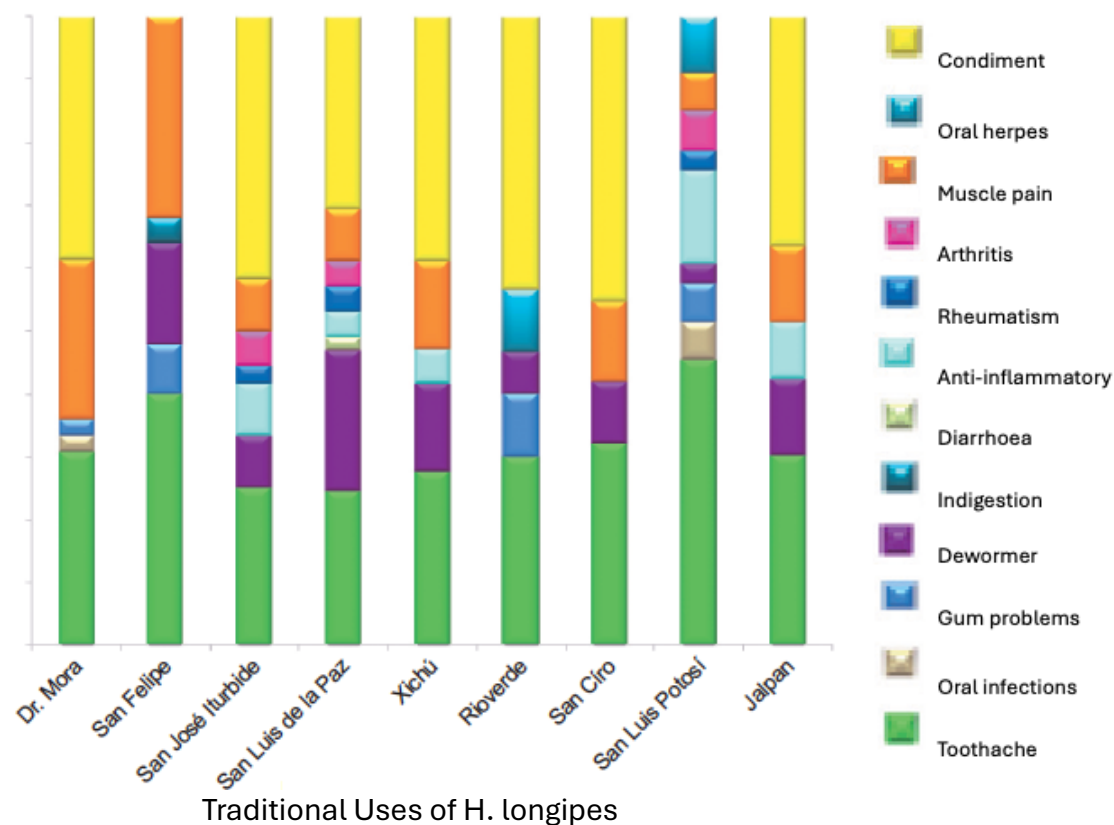
$$\text{price per kilogram} \times \text{annual volume}$$

## Results

### Nomenclature, Knowledge, and Traditional Uses:

The predominant common name for *Heliopsis longipes* in the region is chilcuague, with the variant chilcuán; other names sometimes mentioned include pelitre and raíz de oro (golden root). According to the interviewed individuals, no other plant with the same names is known in the markets visited. Only the root of *H. longipes* is used, which serves various purposes (Figure 2). In Guanajuato, San Luis Potosí, and Querétaro, the most frequent use is as a condiment in sauces and various dishes; for this purpose, five to seven roots of chilcuague are ground. Informants reported that the appeal of the chilcuague root is due to its pungent flavor and the numbing sensation it produces, leading to its combination with chili or its use as a substitute. In traditional medicine, it is used to relieve toothaches, by placing and holding a piece of root on the affected tooth; to alleviate muscle pain, it is used macerated in alcohol; and as a deworming agent, a piece of root is chewed on an empty stomach or consumed daily in food (Figure 2).

Frequency %



**Figure 2:** Traditional uses reported by buyers of *Heliopsis longipes* root in the markets of Guanajuato, San Luis Potosí, and Querétaro where it is sold.

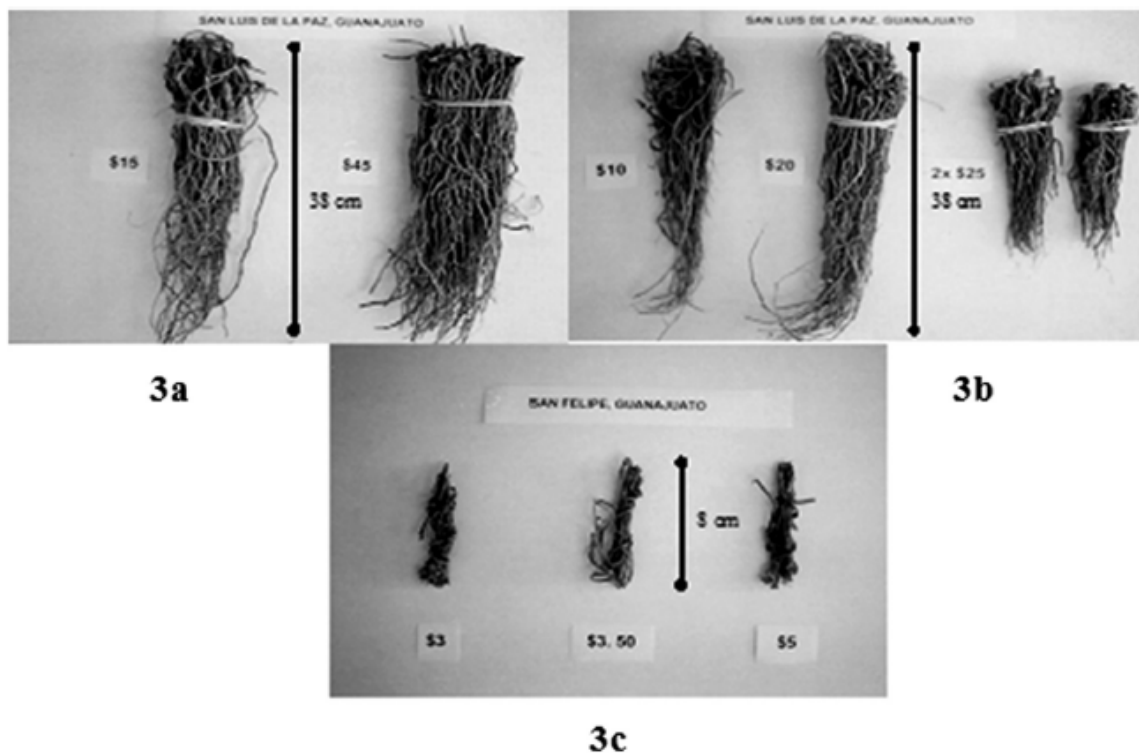
### Harvesting, Sale, and Consumption Practices of Chilcuague Root:

Of the two selected gatherers, one operates in the municipality of Rioverde, S.L.P., and the other in San Luis de la Paz, Gto. Both have been living from the collection of chilcuague and other wild plant species for over 15 years, an activity they carry out year-round. The gatherer from San Luis de la Paz sells bundles of chilcuague directly to vendors at the market in this municipality; the gatherer from Rioverde sells to an intermediary or collector, who then resells to established merchants in that municipality's market. Both gatherers dedicate one or two days a month to the collection of chilcuague roots; in a single day, they extract the roots from 50 to 100 plants to form 20 to 30 bundles (primary bundles, Figures 3a and 3b). Each bundle consists of roots from five to seven plants, and a bundle can weigh between 120 to 200 g; thus, each gatherer obtains between 2400 and 6000 g of chilcuague root per day. It should be noted that the stems of the extracted plants are discarded. None of the informants cultivate chilcuague; all the roots are obtained from wild populations. Both gatherers acknowledge that the abundance of this plant has decreased over the past 20 years, as it was previously easier and more common to find it in the oak and pine-oak forests of the Sierra de Álvarez and Sierra Gorda, in the municipalities of Rioverde and San Luis de la Paz, where they are from.

### Sale:

There are two types of merchants engaged in the sale of chilcuague: established and informal merchants. Established merchants have a specific location within the municipal market, typically specializing in the sale of medicinal or herbal plants; however, chilcuague is also sold in fruit and vegetable stalls. Informal merchants sell outside the market building, in makeshift stalls, and only on market days. To explore other nearby municipalities within the known distribution area of *H. longipes*, the markets of San Felipe and Dolores Hidalgo were visited, municipalities close to the Sierra de Guanajuato. In Dolores Hidalgo, all three existing herbal shops were visited, of which only one sells chilcuague; the other two have stopped selling it due to the increased price per bundle, which has led to a decrease in its consumption; the root sold in this municipality is purchased in San Luis de la Paz. In San Felipe, four herbal shops were found selling chilcuague, with the root offered in this municipality being sourced from the city of San Luis Potosí. The trade and unit of sale for chilcuague root in all the visited municipalities is in bundles (Figure 3). The bundles formed by the gatherer (primary bundles, Figures 3a and 3b) are delivered to merchants in the markets and tianguis of Dr. Mora, San Luis de la Paz, and San José Iturbide (Gto.); Rioverde and San Ciró (S.L.P.); and in Jalpan (Qro.). The weight of the bundles sold in these municipalities generally varies between 30 and 200 g. Merchants create secondary bundles (Figure 3a) from the primary bundles, which are much smaller, weighing only between 2 and 4 g and are offered in herbal shops in the city of San Luis Potosí and San Felipe, Gto. The confirming specimens of *H. longipes* are deposited in the SLPM herbarium (Cilia 113 42505, Cilia 114 42502, Cilia 116 42501, Cilia 117 42504). The ages of the interviewed merchants ranged from 21 to 77 years; their experience selling chilcuague varied greatly, from just one year to 30 and even 50 years, resulting in heterogeneous knowledge about traditional uses. Younger individuals were unaware of the species' origin and some of its uses; those over 35 provided detailed information about uses, preparations, distribution, demand, etc. None of the merchants interviewed in all the

visited markets were producers or gatherers of chilcuague, as they all obtained the root directly from gatherers or intermediaries.



**Figure 3:** Sales presentations of chilcuague. Primary bundles prepared by the gatherer (3a and 3b) and secondary bundles prepared by the merchants (3c).

#### Consumption:

Individuals interviewed over 30 years old had good knowledge of the traditional uses of chilcuague, and most tended to use it; younger individuals (aged 17 to 30) knew little about the plant, being aware of some of its uses but not consuming it. Consumers in the cities of San Luis Potosí and San Felipe only knew about the medicinal uses of chilcuague and currently use it sporadically. In Rioverde and San Ciro, as well as in San Luis de la Paz, Xichú, Dr. Mora, San José Iturbide, and in Jalpan, the root of chilcuague is primarily consumed as a condiment and to relieve toothache (Figure 2). In San Luis de la Paz, consumers mentioned that regular ingestion of the root in food prevents or eliminates parasites. Only in this municipality was the preparation of “burritos con chilcuague” recorded, which are corn masa tortillas filled with beans or nopales seasoned with chilcuague roots; these burritos are traditional and apparently exclusive to this municipality. In Dolores Hidalgo, consumers bought chilcuague to relieve toothaches and as a condiment; however, they stopped using it due to the high prices per bundle.

The traditional uses of chilcuague recorded by municipality are presented in Figure 2.

#### Current Demand for Chilcuague Root:

Chilcuague root is sold year-round in the markets of San Luis de la Paz, Dr. Mora, and San José Iturbide, Gto.; in Rioverde and San Ciro, S.L.P.; and in Jalpan, Qro., municipalities close to the known distribution area of this species. Interviewed individuals in each of the mentioned municipalities acknowledged that up to about 10 years ago, it was sold in greater quantities and was cheaper. In the city of San Luis Potosí and in the municipality of San Felipe, the demand for chilcuague root is one to two bundles per month in each registered herbal shop, as few people know its uses; in Jalpan, each merchant sells two to three bundles per market day; in Rioverde, San Ciro, Xichú, and San José Iturbide, three to five bundles are sold per market day at each registered sales point; in Xichú, each stall sells four to five bundles per market day, and in Dr. Mora, five to six bundles. San Luis de la Paz had the highest demand for chilcuague, with five to seven bundles sold per market day at each registered sales point. It is important to mention that the data presented correspond to one market day per week, as the root of chilcuague is sold every day of the year in the permanent herbal shops. The registered sales points in each visited municipality are presented in Table 1.

**Table 1:** Quantity and value of annual sales (2004) of chilcuague root in markets of San Luis Potosí, Guanajuato, and Querétaro where it is sold.

Locality	Sales Points	Bundles Sold per Market Day	Average Price (pesos/kg) a	Annual Volume (kg) b	Annual Value (pesos) c
San Luis de la Paz	10	86	1049.82	86.62	85121
Dr. Mora	10	63	484.60	136.50	58078
Rioverde	9	67	961.82	75.71	55874
Jalpan	6	22	603.86	43.72	26400
Xichú	4	22	233.84	84.58	20400
San José Iturbide	5	26	409.84	30.45	12480
San Ciro	4	15	588.23	18.36	10000
San Luis Potosí	10	20	1179.45	3.62	5044
San Felipe	4	8	1427.92	1.07	1393
Total	62	329	----	480.63	274790
Average	----	----	771.04		----

a = bundle weight (g) × sale price / 1000 g;

b = bundles sold in a market day × bundle weight (g) × 4 × 12 / 1000 g;

c = price per kg × annual volume;

g = grams

The estimation of the quantity and value of annual chilcuague root sales in the region is shown in Table 1. In 2004, 480.63 kg were sold in the region, with a value of 274,790 pesos; however, each municipality had its particularities. San Luis de la Paz is the municipality with the highest sales of chilcuague bundles and the highest annual value in the region (85,121 pesos). However, while Dr. Mora had the highest volume offered, it had the lowest annual value (58,078 pesos). San Luis Potosí and San Felipe are the municipalities with the lowest sales of chilcuague (3.62 and 1.07 kg, respectively); however, their price per kilogram was the highest in the region.

## Discussion

The name chilcuague is derived from *chilmecatl*, a compound word of Nahuatl origin, consisting of *chilli* or *chili*, which means spicy or pungent, and *mecatl*, which means cord; *chilmecatl* refers to the filiform roots and pungent flavor that characterize *H. longipes* (Martínez, 1967). The name *pelitre* is related to *pellitorine*, an amide discovered in *Anacyclus pyrethrum* DC. (Asteraceae), a species native to North Africa, whose root is used in traditional medicine. Like the root of *H. longipes*, that of *Anacyclus pyrethrum* is pungent and stimulates salivary activity (Gulland and Hopton, 1930). Due to these similarities, *H. longipes* has been named *pelitre del país* or *false pelitre* in Mexico (Ramírez, 1902; Little, 1948a). Thus, *pelitre* is a common name for some Asteraceae, such as *A. pyrethrum*, *Acmella repens* (Walter) Rich, *Erigeron longipes*, and *Spilanthes ocyimifolia* A.H. Moore, which share pungent roots with medicinal properties (Gulland and Hopton, 1930; Little, 1948a; Santamaría, 1959). Therefore, the names *chilcuague* and *pelitre* are due to the characteristic pungent flavor of the roots of *H. longipes*.

The traditional uses of the chilcuague root recorded in the region (as a condiment and to relieve tooth and muscle pain) coincide with those mentioned by Little (1948a, 1948b), Martínez (1967), and Salazar (1999); however, these authors do not mention the use of this plant as a common dewormer incorporated into food. The known uses have persisted in the study region for over 60 years since they were published (Little, 1948a, b); additionally, in all the visited markets, no other plant is known to present the same properties or characteristics as the root of *H. longipes*. The novel uses recorded in this study, along with the confirmation of previously documented uses, indicate that chilcuague remains a culturally important species in its natural distribution area.

An alkamide, N-isobutyl-2,6,8-decatrienoamide (C<sub>14</sub>H<sub>23</sub>NO), was isolated from the root of *H. longipes*; this compound was named *affinine* and attributed with insecticidal properties (Acree et al., 1945). The presence of sugars, flavonoids, and terpenes has been recorded in the root of *H. longipes* (Salazar, 1999), and in the leaves, the presence of sterols, terpenes, and flavonoids has been noted (Cárdenas, 2005). Studies with wild plants conducted by the U.S. Department of Agriculture (Roak, 1947; Little, 1948a) demonstrated that extracts of the root of *H. longipes* exhibit the same toxic and paralyzing effects on flies as *pyrethrum* (*Chrysanthemum cinerariaefolium* Vis). Various studies have been conducted to evaluate the biocidal properties of the root of *H. longipes*; thus, Jacobson et al. (1947) recorded the insecticidal effect of *affinine* on houseflies, and Domínguez et al. (1958) observed it on the bean weevil



(*Acanthoscelides obtectus* Say). Affinine has also been shown to have molluscicidal action (Johns et al., 1982) and fungicidal activity (Ramírez-Chávez et al., 2000), and it has been demonstrated that extracts from its root have anti-infective effects on various bacteria and fungi (Gutiérrez-Lugo et al., 1996). Juárez et al. (2001) evaluated the insecticidal effects of the leaves, flowers, and roots of *H. longipes*, finding that only the root exhibited insecticidal action, which explains the traditional use of only the root of this plant. However, Cárdenas (2005) did find fungicidal effects in the foliage. The presence of affinine in the root of *H. longipes* and its biocidal property seems to justify its traditional use as a daily intestinal dewormer by the inhabitants of the geographical region where this species occurs.

The age of the informants influenced the quantity and quality of the ethnobotanical information provided; regarding the interviewed merchants, younger individuals were unaware of the species' origin and its uses, while informants over 35 provided better information about the uses, preparations, distribution, and demand for chilcuague root. The same situation was noted with users or consumers, as those interviewed over 30 years of age had a good understanding of the traditional uses of chilcuague, and most still consume it; conversely, informants younger than 30 knew little about the uses of chilcuague and most did not consume it. This direct relationship between the informant's age and their ethnobotanical knowledge aligns with what was documented by Estrada et al. (2001) in a forested region of the State of Mexico.

The frequency of chilcuague sales is directly related to knowledge of its traditional uses; thus, in the markets of San Luis de la Paz, Dr. Mora, Rioverde, and Jalpan, an average of four to five bundles are sold at each sales point during market days, and these municipalities are where the highest volume is sold and the greatest annual sales value is reached in the region (Table 1). Conversely, in San Luis Potosí and San Felipe, sales are sporadic, averaging one to two bundles per month, as few people know its uses. The highest prices per bundle in the region were recorded in Doctor Mora and San Luis de la Paz (30 and 50 pesos, respectively), while the lowest were in the city of San Luis Potosí and San Felipe (3.00 pesos), though with very different sizes. These data align with those recorded by Salazar (1999), as in the city of San Luis Potosí, the small bundle of root was sold for 0.50 pesos and in San Luis de la Paz for 18 pesos that year. Regarding the value of the root per kilogram, prices are higher in markets with greater intermediation (Rioverde, San Luis de la Paz, San Luis Potosí, and San Felipe).

The extensive knowledge about the traditional uses of chilcuague root is directly related to the higher frequency of sales, occurring in San Luis de la Paz, Doctor Mora, and Rioverde, municipalities situated within the most likely natural distribution area of *H. longipes*. The lack of knowledge about traditional uses and the foreign origin of the chilcuague root offered in the markets of San Felipe and Dolores Hidalgo, along with the absence of written references and botanical collections, are indicators that make it unlikely for the Sierra de Guanajuato to be part of the natural distribution area of chilcuague; however, a floristic exploration of this area is needed to confirm its absence in this Sierra. Thus, *Heliopsis longipes* is a wild species that is economically and culturally important, with various traditional uses in the region where it is endemic. The sale of chilcuague root is practiced year-round in the markets of San Luis de la Paz, Dr.

Mora, and San José Iturbide in Guanajuato; in Rioverde and San Ciró in San Luis Potosí; and in Jalpan, Querétaro. The availability of this resource is likely diminishing due to its current destructive harvesting method and because its use has persisted in the localities associated with its distribution area. It is essential to conduct population and ecological studies to determine the current status of wild populations, as well as studies on the propagation of *H. longipes*, to reduce the pressure from current harvesting on wild populations.

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