



Checklist of the genus *Quercus* (Fagaceae) of Aguascalientes, México

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Abstract: Twenty-five species of *Quercus* were collected in the state of Aguascalientes, 11 members of *Quercus* sect. *Lobatae* (red oak) and 14 members of *Quercus* sect. *Quercus* (white oak). Ten species were newly recorded. *Quercus potosina* is the commonest and most widely distributed species in the state. Eight species were found only in a single municipality, Calvillo or San José de Gracia. The species of *Quercus* are mainly distributed in oak and pine-oak forest in the western part of Aguascalientes. The municipalities with the greatest numbers of species are San José de Gracia, Calvillo and Jesús María, while Aguascalientes, Asientos, Cosío, El Llano, Rincón de Romos, Pabellón de Arteaga, and Tepezalá have the fewest representatives. San Francisco de los Romo is the only municipality without any *Quercus* records.

Key words: oaks; species inventory; new records

INTRODUCTION

The genus *Quercus* L. is among the most ecologically important forest species because *Quercus* species are dominant in many plant communities (NIXON 2006). *Quercus* forests are the most characteristic plant communities of the mountainous areas of México. Along with pine forests, oak forests are the most widespread vegetation found in these temperate and semi-humid climates. But, *Quercus* species are not limited to these climates. Their extensive ecological amplitude is associated with the mountain cloud forests, as well as various types of tropical forests and grasslands (RZEDOWSKI 2006).

The highlands of central and eastern México are an important center for genus diversity of the genus (NIXON 1993b). According to ZAVALA (1998), due to environmental characteristics, oak species are not evenly distributed within México. Oaks occur from sea level up to 3100 m, although more than 95% of Mexican *Quercus* species are found between 1200 and 2800 m. Oaks are found in all Mexican states, including the smaller and less diverse states, such as Aguascalientes, with the exception that

none occur in Yucatán (RZEDOWSKI 2006).

In Aguascalientes, one of the smallest of the Mexican states, two major physiographic units are recognized: xerophytic and temperate. The eastern half of the state is a semiarid region where drier conditions predominate. This portion of the state consists of a broad valley bounded by a system of plateaus and low hills in the far east. Plant communities of this region are typical of a semi-arid climate and include crasicaules or thorny scrub, mesquite forests, and grasslands. The western half of the state is mountainous with a complex topography of mountains, plateaus, and canyons. This region is dominated by oak and oak-pine forests in the higher mountains, while in the extreme southwest there are tropical elements represented by a small portion of tropical deciduous forest in the valley of Calvillo.

Botanically, Aguascalientes was barely explored until 1980, when the “Flora del Estado de Aguascalientes” project was initiated. Since that time, floras have been published on aquatic plants, cacti, grasses, medicinal plants, legumes, oaks, pines, and composites among others (DE LA CERDA 1996, 1999a; GARCÍA 1999a, 1999b; SIQUEIROS 1996, 1999a, 1999b). McVAUGH (1974) published previous floristic records about the *Quercus* of Aguascalientes in “Flora Novogaliciana”. This region includes the states of Jalisco, Colima and Aguascalientes, and portions of Nayarit, Durango, Guanajuato, Zacatecas and Michoacán. McVaugh reported 44 species of oak in New Galicia, 11 of which were from Aguascalientes. Later, DE LA CERDA (1989, 1999b) reported 15 and 17 species, respectively. The goal of this study is to present a complete checklist and to update the floristic inventory of *Quercus* species in the state of Aguascalientes.

MATERIALS AND METHODS

Study site

At 5,680 km², Aguascalientes is the third smallest state in México. It is located between 21°38'03" N and 102°07'06" W

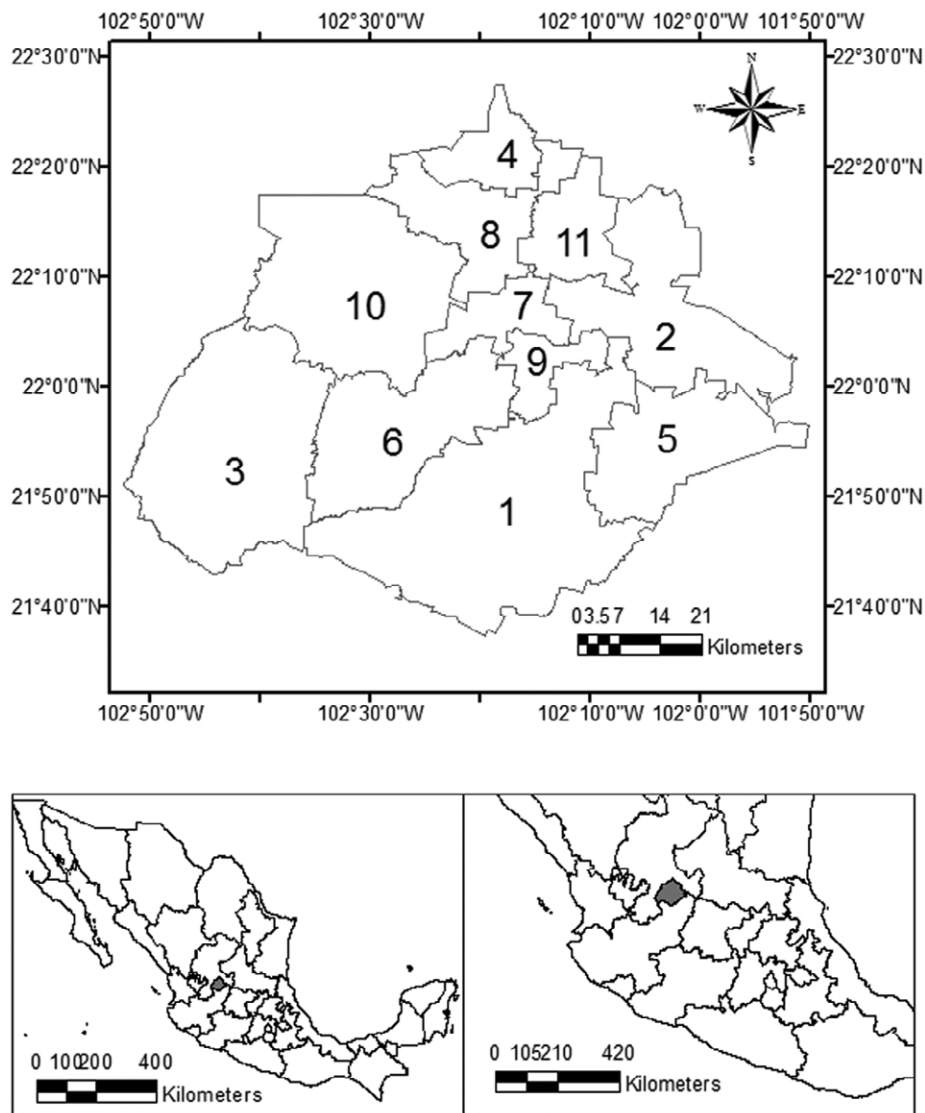


Figure 1. Map and location of Aguascalientes, México. 1: Aguascalientes. 2: Asientos. 3: Calvillo. 4: Cosío. 5: El Llano. 6: Jesús María. 7: Pabellón de Arteaga. 8: Rincón de Romos. 9: San Francisco de los Romo. 10: San José de Gracia. 11: Tepezalá.

in the central part of México. It is bordered by Zacatecas to the north, east and west, and by Jalisco to the south. Aguascalientes is divided into 11 municipalities: Aguascalientes, Asientos, Calvillo, Cosío, El Llano, Jesús María, Pablo de Arteaga, Rincón de Romos, San Francisco de los Romo, San José de Gracia, and Tepezalá (Figure 1). The state is included within three physiographic provinces: Western Mother Mountains (to the northwest), Central plateau (central part from north to south), and Trans-Mexican volcan belt (southwest) (CONABIO 2008). The predominant physiography of Aguascalientes is a great central plain, with some lower elevations, covered with xerophytic thorny scrub. The more common species found are *Acacia farnesiana* (L.) Willd., *Prosopis laevigata* (Humb. & Bonpl. ex Willd.) M.C.Johnst., *Mimosa biuncifera* Benth., and *Opuntia streptacantha* Lem., among others. A mountainous region covered with coniferous and oak forest is located in the northwest portion of the state at elevations that range from 1570–3020 m, with an average temperature range between 16.0–18.0°C. To the southwest of the state, there is a disturbed subtropical area covered with

dry tropical forest where these dominant taxa are found: *Bursera fagaroides* (Kunth) Engl., *Ficus petiolaris* Kunth, *Leucaena esculenta* Benth., *Lysiloma microphyllum* Benth., and *Myrtillocactus geometrizans* Console (DE LA CERDA & SIQUEIROS 1985). The annual average temperature is between 20.0–22.0°C. Most of the state is semiarid (86%); the remaining 14% is temperate (CONABIO 2008).

Data collection

The study included plants collected throughout the state from 2010 to 2015, collections from the herbarium HUAA were also included. One hundred and twenty sites were sampled to cover the whole *Quercus* forest distribution in Aguascalientes (Figure 2). Vegetation types of Aguascalientes are according to SIQUEIROS et al. (2016) (Figure 3). Species of *Quercus* were identified using specialized literature (DE LA CERDA 1999b; ESPINOSA 2001; GONZÁLEZ 1986; McVAUGH 1974; ROMERO et al. 2014). The *Quercus* checklist is organized alphabetically by species; material examined includes localities organized alphabetically by

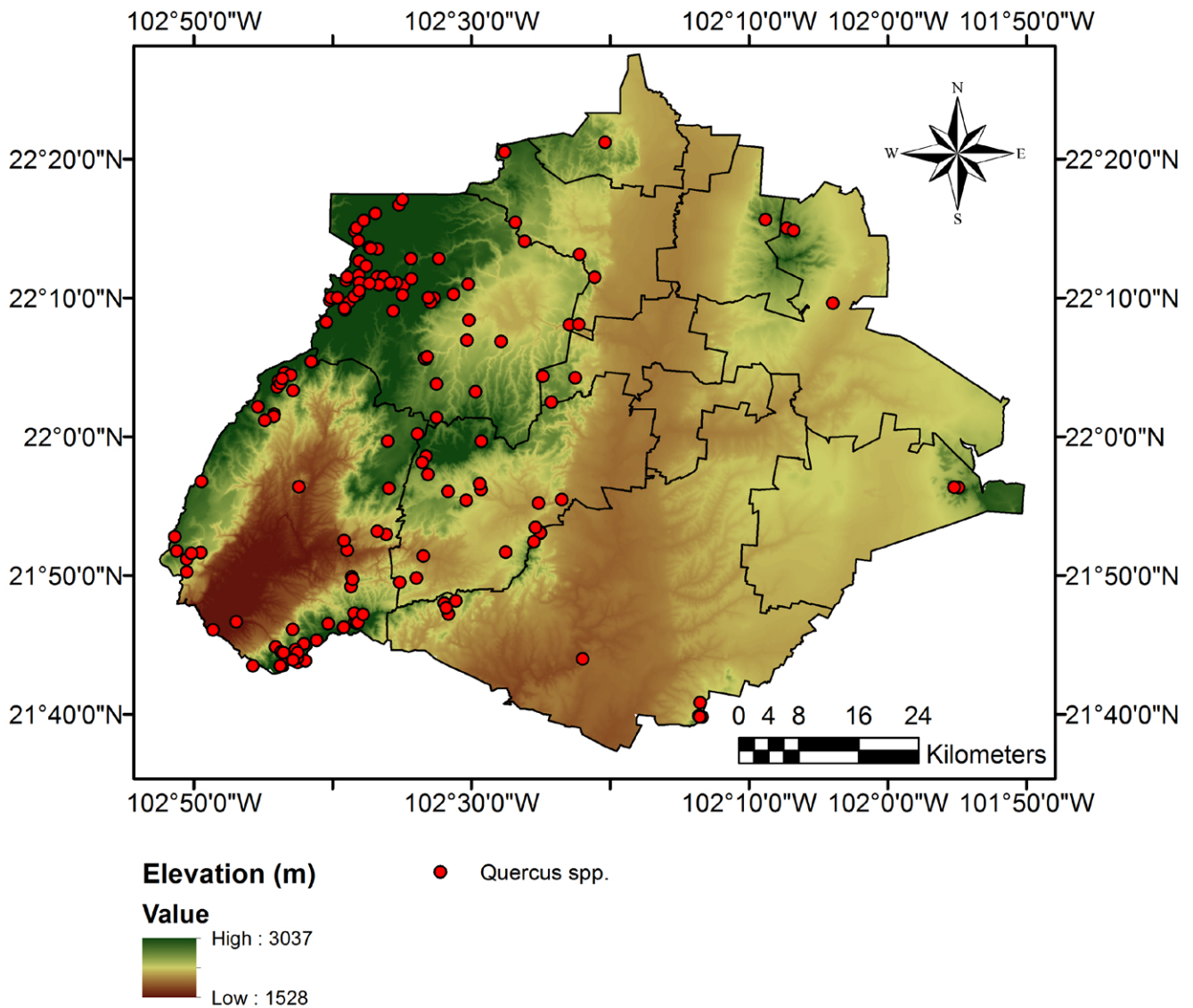


Figure 2. Map of elevation and sampling sites of genus *Quercus* in Aguascalientes, México. Borders of municipalities are shown. (Map by Victor M. Mtz. Calderón).

municipality, plant communities, elevation, collection number, collector, and voucher. Samples lacking a collection number are labeled *s/n* (Table 1.). Additional information was extracted from collected materials from Aguascalientes and specialized literature. All specimens are from Aguascalientes and are deposited at herbarium HUAA.

RESULTS

This study recorded 25 species of oaks from Aguascalientes, including 11 members of *Quercus* sect. *Lobatae* (red oak) and 14 members of *Quercus* sect. *Quercus* (white oak) according to the infrageneric classification of NIXON (1993a) (Table 1). Ten species were newly recorded from the state: *Q. depressipes*, *Q. deserticola*, *Q. durifolia*, *Q. greggii*, *Q. magnoliifolia*, *Q. mexicana*, *Q. obtusata*, *Q. praeco*, *Q. repanda* and *Q. striatula*.

Quercus chihuahuensis, *Q. eduardii*, *Q. grisea*, *Q. laeta*, *Q. potosina*, and *Q. resinosa* are the most-represented species in Aguascalientes, while *Q. candicans*, *Q. greggii* and

Q. mexicana are the scarcest. *Quercus potosina* is the more widely distributed oak, usually forming forests in association with *Q. eduardii*, *Q. rugosa* and *Juniperus deppeana* Steud. *Quercus candicans*, *Q. deserticola*, *Q. durifolia*, *Q. greggii*, *Q. laurina*, *Q. magnoliifolia*, *Q. mexicana* and *Q. viminea*, are distributed in temperate or subtropical environments in San José de Gracia and Calvillo, respectively (Table 2). The temperate area possesses the greatest number of oak species in the state; it is located in the western part of Aguascalientes and possesses the highest elevations. The central plain with xerophytic vegetation, including the Asientos, Cosío, El Llano and Tepezalá municipalities, have the fewest number of species with a dominance of *Q. potosina*. Species of *Quercus* are found in all municipalities of Aguascalientes, except San Francisco de los Romo. Oaks in Aguascalientes inhabit mainly oak forest and pine-oak forest but are also found in temperate grassland and areas with a climate that is transitional between subtropical and arid; oaks occur at an average elevation of 2000–2600 m (Figure 2).

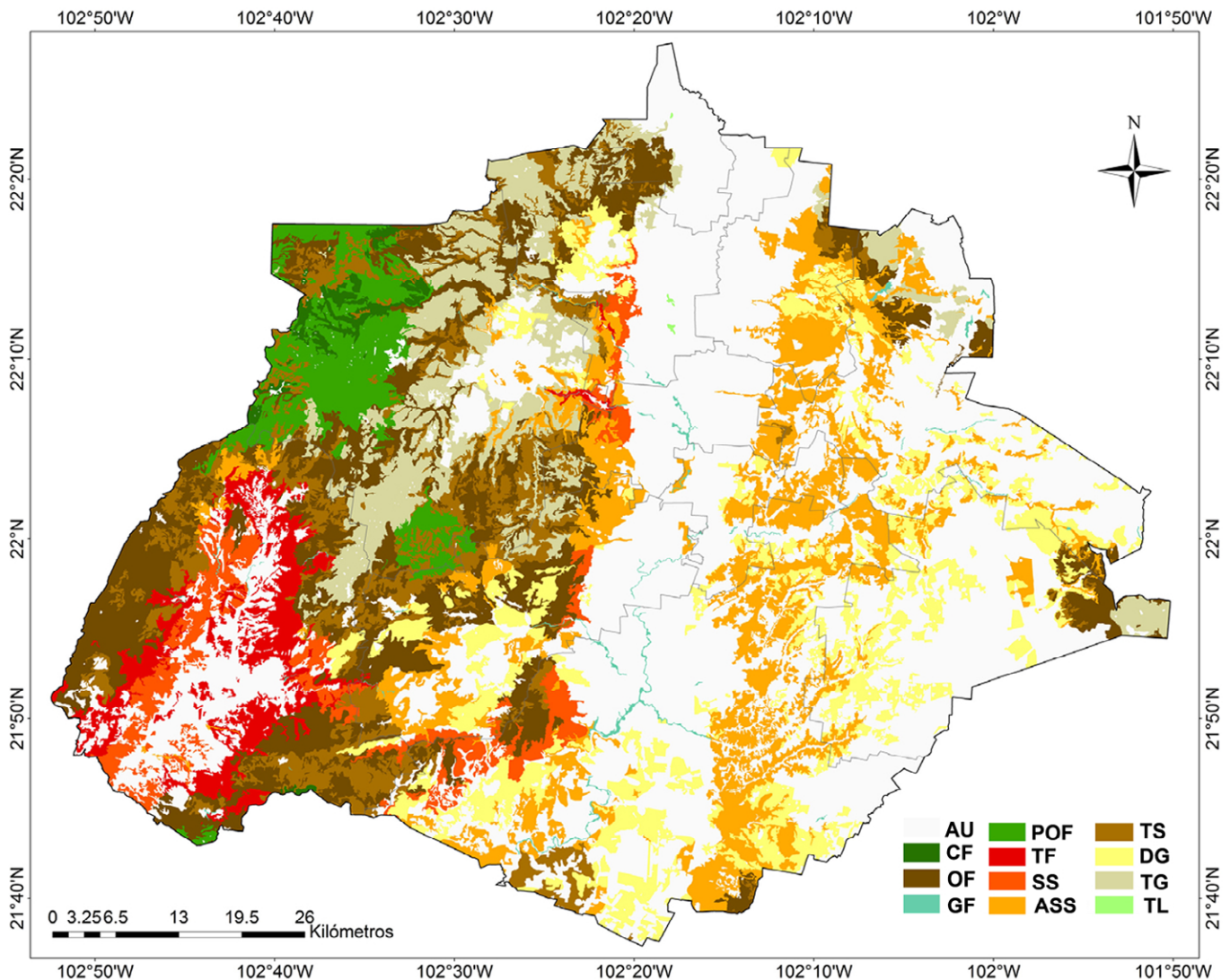


Figure 3. Vegetation of Aguascalientes, Mexico. AU: Agriculture-urban. CF: Coniferous forest. OF: Oak forest. GF: Gallery forest. POF; Pine-oak forest. TF: Tropical forest. SS: Subtropical scrub. ASS: Semiarid scrub. TS: Temperate scrub. DG. Desert grassland. TG: Temperate grassland. TL: Tular.

List of species

Quercus aristata Hook. & Arn. Figure 4A.

Quercus aristata HOOKER & ARNOTT (1841): 444. — GONZÁLEZ (1986): 31; McVAUGH (1974): 11.

Q. productipes TRELEASE (1924): 140. — GONZÁLEZ (1986): 31.

Material examined: Table 1.

Tree of 4–12 m high. Leaf coriaceous, of 7–12 × 2–6 cm, elliptic-lanceolate or elliptic-oblongate, sometimes obovate, with 1–5 aristate teeth at the leaf margin, apex obtuse, rounded or acute, ending in awn, upper surface lustrous and glabrous, lower surface glabrescent, base cordate to rounded. Fruit annual, cupule hemispherical, nut ovoid-rounded of 12 mm.

In México, this species is distributed in the states of Aguascalientes, Jalisco, Guanajuato, Guerrero, Nayarit and Sinaloa. It is scarce in Aguascalientes, and has been found in the municipalities of San José de Gracia, Calvillo and Jesús María in oak and pine-oak forests from 2028–2570 m.

Quercus candicans Née. Figure 4B.

Quercus candicans NÉE (1801): 277. — GONZÁLEZ (1986): 35.

Q. calophylla SCHLECHTENDAL & CHAMISSO (1830): 79. — GONZÁLEZ (1986): 35.

Material examined: Table 1.

Tree of 8–18 m high. Leaf coriaceous, of (9)13–22 (–28) × (3.5)7–11 (–16) cm, obovate, oblong-obovate or oblanceolate, with 10–13 awned teeth at the leaf margin, apex acute or acuminate, ending in awn, upper surface lustrous and glabrous, lower surface tomentose and whitish, base subcordate to round. Fruit biannual, cupule hemispherical, nut ovoid 15–18 × 11–16 mm.

Distributed in Colombia and México, where it is found in the states of Aguascalientes, Chihuahua, Chiapas, Distrito Federal, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, San Luis Potosí, Sinaloa, and Veracruz. In Aguascalientes, it was only found in Calvillo municipality in humid oak forest, from 2256–2400 m.

Table 1. Species checklist of oaks (Fagaceae) in Aguascalientes, México, ordered by section.

Section/species	Municipality	Localities	Plant communities	Elevation (m)	Voucher
LOBATAE					
<i>Q. aristata</i> Hook. & Arn.	Calvillo	1.5 km E of Dam los Alamitos, Sierra del Laurel, 21°43'51"N, 102°41'57"W	Oak forest	2430	Rosales 3854 (HUAA 19951)
		Path to Los Alisos, Sierra del Laurel, 21°44'26.71"N, 102°43'45.81"W	Oak forest	2028	De Alba s/n (HUAA 19998)
	Jesús María	Las Moras, 21°46'06.8"N, 102°42'52.1"W	Oak forest	2350	De la Cerda 2782 (HUAA 5144)
	San José de Gracia	Gully La Saucedá, 21°58'36"N, 102°33'15"W	Pine-oak forest	2570	Martínez-Ramírez 1937 (HUAA 28598)
<i>Q. candicans</i> Née	Calvillo	Gully los Hoyos, 22°11'31.2"N, 102°38'56.7"W	Pine-oak forest	2350	De la Cerda s/n (HUAA 1125)
		Gully Oscura, N of Sierra del Laurel, 21°46'40"N, 102°38'12"W	Pine-oak forest	2500	De la Cerda 2780 (HUAA 4991)
	Calvillo	Sierra Fria	Oak forest	2400	De la Cerda & García 1335 (HUAA 4089)
		Gully Oscura, 0.5 km SE of Rancho Boca Oscura, 21°46'37"N, 102°38'09"W	Pine-oak forest	1880	Arteaga 11404 (HUAA 4213)
<i>Q. castanea</i> Née	Calvillo	Oak forest with elements of cloud forest	Oak forest	2256	Martínez-Ramírez 1933 (HUAA 28562)
		Stream El Ocote, 3 km N-NE of El Terrero, Sierra del Pinal, 21°51'36"N, 102°49'28.88"W	Oak forest	2300	Rodríguez 603 (HUAA 12135)
		1 km S of Terrero del Refugio, 21°51'10"N, 102°50'31"W	Relict oak forest	2000	García 4932 (HUAA 4932)
		La Cienega (Los Alisos), 21°44'09"N, 102°42'56"W	Pine-oak forest	2300	García 2561 (HUAA 6024)
		2 km NW of Terrero del Refugio, 21°52'48.75"N, 102°51'22"W	Oak forest	2325	De la Cerda 5824 (HUAA 13192)
		Gully El Huarache 1.7 km NW of El Terrero del Refugio, 21°51'46"N, 102°51'14.6"W	Oak forest-temperate scrub	2293	Martínez-Calderón 30 (HUAA 29913)
		Gully of Arroyo Ojocalentillo, 1 km N of Las Joyas, 21°45'16"N, 102°39'12"W	Pine-oak forest	2327	Martínez-Ramírez 1967 (HUAA 28607)
		Gully La Saucedá, 21°58'36"N, 102°33'15"W	Pine-oak forest	2570	Martínez-Ramírez 1938 (HUAA 28595)
		Laguna Seca, Sierra San Blas de Pabellón, 22°11'06"N, 102°38'03.61"W	Oak forest	2660	Rosales 3807 (HUAA 23066)
		8.11 km N of Temazcal, 22°04'26"N, 102°43'01"W	Oak forest	2556	Adame & Rosales 1173 (HUAA 21826)
<i>Q. durifolia</i> Seemert*	San José de Gracia	0.5 km S of El Aldeano, 18 km W of La Congoja, 22°09'16"N, 102°39'08"W	Pine-oak forest	2695	Martínez-Ramírez 1942 (HUAA 28676)
		Gully El Rico, 5.7 km NW of La Congoja, 22°12'50.68"N, 102°34'21.13"W	Oak forest	2404	Martínez-Calderón 100 (HUAA 19918)
		16 km NW of La Congoja, S hillside of Cerro El Pujido, 22°14'08"N, 102°38'08"W	Pine-oak forest	2839	Martínez-Ramírez 2113 (HUAA 19919)
		Hillside NW of Hill El Picacho, 21°53'27"N, 102°25'23"W	Temperate scrub	2100	De la Cerda & García 1011 (HUAA 11110)
<i>Q. eduardii</i> Trel.	Aguascalientes	1 km W of Ignacio Zaragoza, path to Cerro del Muerto, 21°51'41.2"N, 102°27'32"W	Temperate scrub	2050	De la Cerda 6083 (HUAA 14645)
		Cerro de Los Gallos, 500 m NW of the antennas, 21°39'54"N, 102°13'15"W	Oak forest	2100	González 1391 (HUAA 21859)
		2 km NW of El Ocote, 21°47'40.8"N, 102°31'49.9"W	Temperate scrub	2300	Martínez-Calderón 85 (HUAA 29920)
		Los Alamitos, 21°43'64"N, 102°42'82"W	Oak forest	2300	De la Cerda 6307 (HUAA 15283)
Calvillo	Los Alisos, 21°44'29"N, 102°43'42"W	Oak forest-tropical forest	2035	Rosales 3807 (HUAA 23069)	
	5 km NW of El Terrero, 22°02'09.67"N, 102°45'22.41"W	Temperate grassland	2000	De la Cerda & García 1533 (HUAA 1092)	
	Hillside E of El Cerro de la Mesilla, Sierra del Laurel	Pine-oak forest	2450	Rodríguez 285 (HUAA 9557)	
	Gully Oscura, N of Sierra del Laurel, 21°46'40.6"N, 102°38'12.3"W	Oak forest	2400	De la Cerda & García 1339 (HUAA 78)	
	Las Moras, 21°46'06.8"N, 102°42'52.1"W	Pine-oak forest	2350	De la Cerda 2783 (HUAA 5145)	
	Arroyo Ojocalentillo, 1 km N of Las Joyas, 21°45'16"N, 102°39'12"W	Oak forest	2327	Martínez-Ramírez 1963 (HUAA 28600)	
	Hillside E of Dam El Capulín, 21°49'31.1"N, 102°35'10.6"W	Oak forest	2100	De la Cerda & García 1427 (HUAA 1281)	
	2 km N of Milpillas de Abajo, 21°57'16.62"N, 102°33'07.80"W	Temperate scrub	2350	Vega 201 (HUAA 4082)	
	1.5 km SW of Dam San Rafael	Pine-oak forest	2050	Vega 189 (HUAA 4062)	
	2 km N of Gracias a Dios, 21°56'37.50"N, 102°29'23.49"W	Temperate scrub	2100	Ramírez 45 (HUAA 4080)	
	Stream El Mirador, 4 km W of Los Miradores, 21°47'33"N, 102°36'31"W	Oak forest	2344	Martínez-Ramírez 1957 (HUAA 29565)	
	1 km SW of Gracias a Dios, 21°55'24.78"N, 102°30'21.72"W	Temperate scrub	2050	Vega 40 (HUAA 4059)	
2 km SE of Dam El Capulín, 21°49'48"N, 102°33'58"W	Pine-oak forest	2000	Vega 91 (HUAA 4090)		

Continued

Table 1. Continued.

Section/species	Municipality	Localities	Plant communities	Elevation (m)	Voucher
<i>Q. gentryi</i> C.H. Mull.	Pabellón de Arteaga	Hillside W of El Garabato	Vestigial oak forest	2050	Rosales 3230 (HUAA 7745)
	Rincón de Romos	Gully Juan Caporal, 22°15'26"N, 102°26'50.2"W	Oak forest	2112	Siqueiros 4695 (HUAA 23070)
	San José de Gracia	NW of Congoja, Sierra Fria, 22°11'22"N, 102°34'19"W	Pine-oak forest	2400	Loera et al. s/n (HUAA 23465)
		Path to Dam de La Araña, 22°13'35.73"N, 102°37'15.42"W	Pine-oak forest	2350	García s/n (HUAA 480)
		Gully Las Cazuelas	Pine-oak forest	2350	Cuellar et al. 41 (HUAA 8765)
		12 km on terrace near La Congoja-El Temazcal, 22°09'43.78"N, 102°38'49.41"W	Oak forest	2730	Nieto 3 (HUAA 23578)
		Ca 8.5 km NW of La Congoja, 22°13'32.75"N, 102°36'44.26"W	Pine-oak forest	2730	Sabás et al. 13 (HUAA 23663)
		800 m from Gully de Chupaderos	Oak forest	2430	Gutiérrez 58 (HUAA 5466)
		Gully Piletas, Sierra Fria, 22°11'31.42"N, 102°36'17.03"W	Pine-oak forest	2450	De la Cerda & García 480 (HUAA 7002)
		Rancho el Zepo (Sierra Fria), 22°11'04.55"N, 102°35'49.29"W	Oak forest	2570	De la Cerda & García s/n
		7.78 km NW of El Temazcal, 22°04'01.55"N, 102°43'54.31"W	Oak forest	2530	González 1162 (HUAA 21835)
		10 km W of La Congoja, 22°09'45.26"N, 102°39'07.23"W	Pine-oak forest	2530	García s/n (HUAA 50)
	Agua Zarca Biological Station, 22°05'35.58"N, 102°33'17.41"W	Oak forest	2200	Rosales 1480 (HUAA 16517)	
	Cañada "Agua Escondida", 22°11'38.8"N, 102°38'06.2"W	Pine-oak forest	2693	López 34 (HUAA 19521)	
	Cabañas las Manzanillas, 1.99 km N of El Zepo, 22°11'31.38"N, 102°36'47.64"W	Oak forest	2609	González 1113 (HUAA 21796)	
	0.36 km SW of Laguna Seca, 21°11'1.67"N, 102°38'11.30"W	Pine-oak forest	2687	González 1118 (HUAA 21792)	
	Around La Congoja, 22°09'38.29"N, 102°32'57.33"W	Oak forest	2494	González 1109 (HUAA 21799)	
	Forest station, Sierra Fria	Oak forest	2583	González & Rosales 1177 (HUAA 21821)	
	3 km NW of El Temazcal, 22°05'35.58"N, 102°33'17.41"W	Oak forest	2162	González & Rosales 1152 (HUAA 21771)	
	6.44 km SW of El Zepo, 21°10'58.94"N, 102°35'48.98"W	Oak forest	2618	González 1136 (HUAA 21785)	
Gully La Boquilla, 1 km E of Rancho Las Camas	Oak forest	2140	De la Cerda & García 584 (HUAA 21877)		
Peñón Blanco 3.5 km E of La Congoja, 22°10'15.36"N, 102°31'17.24"W	Oak forest	2304	González 1104 (HUAA 21770)		
Gully el Calderón, 4 km SE of Paredes, 22°06'51.3"N, 102°27'52.8"W	Temperate grassland and oak forest	2300	Martínez-Calderón 1 (HUAA 29921)		
<i>Q. gentryi</i> C.H. Mull.	Calvillo	1 km S of Terreno del Refugio, 21°51'36"N, 102°50'10"W, Cañada El Pilar, to NW of Temazcal, 22°03'52.05"N, 102°43'46.35"W	Oak forest-subtropical scrub	2250	De la Cerda 7624 (HUAA 22087)
		Gully Oscura, 21°46'40.6"N, 102°38'12.3"W	Oak forest	2450	López 33 (HUAA 19523)
		8 km from Los Alisos,	Oak forest	2400	De la Cerda & García 522 (HUAA 6963)
		4 km NW of Temascal, 22°01'11"N, 102°44'53"W	Oak forest	2320	Siqueiros 2561 (HUAA 3831)
		3 km S of Terrero, 21°50'16"N, 102°50'31"W	Tropical forest-oak woodland	2200	De la Cerda 6217 (HUAA 16389)
		La Cuchilla	Oak forest-temperate scrub	2150	De la Cerda & García 1522 (HUAA 3825)
		Los Alisos, 21°44'29"N, 102°43'42"W	Oak forest	2625	García 2105 (HUAA 5147)
		1 km E of Los Alisos, 21°44'27"N, 102°42'31"W	Oak forest	2035	De la Cerda 7257 (HUAA 19854)
		1 km W of El Garruño, 21°44'27.0"N, 102°43'32.8"W	Subtropical scrub-oak forest	2150	De la Cerda & García 759 (HUAA 1126)
		Gully, 4 km N of Milpillas, 21°58'08.4"N, 102°33'32.8"W,	Oak forest-subtropical scrub	2084	Martínez-Calderón 72 (HUAA 29922)
	Jesús María	Hillside E of Cerro de la Mesilla, Sierra del Laurel, 21°43'30"N, 102°43'45"W	Oak forest	2244	Martínez-Ramírez 2389 (HUAA 29923)
	Calvillo	NE of Dam Los Alamitos, 21°44'02.33"N, 102°42'32.57"W	Pine-oak forest	2450	Rodríguez 287 (HUAA 9554)
		Mesa Las Escobas, Sierra de Laurel, 21°46'15.63"N, 102°39'13.65"W	Oak forest	2700	García 3998 (HUAA 16696)
		Las Moras, 21°46'06.8"N, 102°42'52.1"W	Oak forest	2400	García 4544 (HUAA 14259)
		NE of Los Alisos, 21°44'40.41"N, 102°42'40.41"W	Pine-oak forest	2350	De la Cerda 2781 (HUAA 5094)
	Cerro del Laurel, 21°46'51.97"N, 102°38'14.95"W	Oak forest	2350	García 2794 (HUAA 6569)	
Jesús María	Gully La Saucedá, 21°58'36"N, 102°33'15"W	Oak forest	2400	García 3325 (HUAA 12203)	
		Pine-oak forest	2570	Martínez-Ramírez 1940 (HUAA 28597)	

Continued

Table 1. Continued.

Section/species	Municipality	Localities	Plant communities	Elevation (m)	Voucher		
<i>Q. laurina</i> Humb. & Bonpl.	San José de Gracia	Gully Los Hoyos, 21°46'15.63"N, 102°39'13.65"W	Pine-oak forest	2500	De la Cerda 2779 (HUAA 5074)		
		Path, 15 km to Dam of La Araña	Pine-oak forest	2700	Siqueiros 2297 (HUAA 3304)		
		Laguna Seca, Sierra San Blas de Pabellón, 22°10'17.71"N 102°38'06.81"W	Oak forest	2650	García 2440 (HUAA 5034)		
		Cerro El Conejo, Sierra Fria, 102°34.5'85"W, 22°16.6'50"N	Oak forest	2795	González & Rosales 846 (HUAA 19743)		
		0.50 km NE of Laguna Seca	Oak forest	2698	González & Rosales 1185 (HUAA 21840)		
		5 km from Paraje Don Pepe	Pine-oak forest	2600	Siqueiros 2737 (HUAA 4198)		
		Path to El Alamo, Cerro El Primo, Monte Grande Sierra Fria, 102°37'45.4"W, 22°15'35.1"N	Oak forest	2863	Siqueiros 4669 (HUAA 19927)		
		16 km NW of La Congoja, hillside S of Cerro El Pujido, 22°14'08"N, 102°38'08"W	Pine-oak forest	2839	Martínez-Ramírez 2112 (HUAA 29930)		
		<i>Q. mexicana</i> Humb. & Bonpl.*	Rincón de Romos	Gully Juan Caporal, 22°15'26"N, 102°26'50.2"W	Oak forest	2112	Siqueiros 4698 (HUAA 19844)
				<i>Q. sideroxylo</i> Humb. & Bonpl.	Calvillo	Gully Hillside W, El Pinal, 22°04'11.97"N, 102°43'37.34"W	Oak forest
14 km N of Temazcal	Oak forest	2530	De la Cerda & García 913 (HUAA 1115)				
Gully de Las Palomas, Sierra Brava, 22°01'23"N, 102°32'30"W	Oak forest	2300	González 1225 (HUAA 28675)				
Gully La Saucedá, 21°58'36"N, 102°33'15"W	Pine-oak forest	2570	Martínez-Ramírez 1939 (HUAA 28596)				
W of Barbechitos, Sierra Fria, 22°16'05"N, 102°36'55"W	Pine-oak forest	2600	Loera et al. s/n (HUAA 23453)				
Gully Piletas, Sierra Fria	Pine-oak forest	2450 m	Gutiérrez 37 (HUAA 5470)				
Ciénega de Galarido, Sierra Fria, 22°08'16"N, 102°39'87"W	Oak forest	2559 m	Clark-Alonso 750-b (HUAA 19708)				
Cañada "Agua Escondida", 22°11'38.8"N, 102°38'06.2"W	Pine-oak forest	2693 m	López 35 (HUAA 19513)				
Dam La Araña, 22°13'40.70"N, 102°37'21.80"W	Pine-oak forest	2640 m	Siqueiros 2869 (HUAA 4517)				
Gully El Rico, Sierra de San Blas de Pabellón, 22°12'45.26"N, 102°33'24.16"W	Pine-oak forest	2500 m	García 2456 (HUAA 6133)				
<i>Q. virminea</i> Trel.	Calvillo	Playa Mariquitas, Monte Grande, Sierra Fria, 22°15.0'25"N, 102°38.1'70"W	Pine-oak forest	2867 m	Siqueiros 4667 (HUAA 20242)		
		Brecha al Alamo, Cerro El Pino, Monte Grande Sierra Fria, 22°15.3'51"N, 102°37.4'54"W	Oak forest	2863	Siqueiros 4670 (HUAA 19928)		
		Rancho el Zepo (Sierra Fria), 22°11'04.55"N, 102°35'49.29"W	Oak forest	2570	De la Cerda & García 781 (HUAA 72)		
		4 km W of Jaguey	Oak forest	2550	De la Cerda & García 1080 (HUAA 1122)		
		Forest station, Sierra Fria,	Oak forest	2583	González & Rosales 1174 (HUAA 21824)		
		0.36 km SW of Laguna Seca, 21°11'11.6"N, 102°38'11.30"W	Pine-oak forest	2687	González 1119 (HUAA 21793)		
		Rancho El Sinai	Oak forest	2691	González & Rosales 1180 (HUAA 21831)		
		0.5 km S of El Aldeano, 18 km W of La Congoja, 22°09'16"N, 102°39'08"W	Pine-oak forest	2695	Martínez-Ramírez 1950 (HUAA 28683)		
		Las Moras, 21°46'06.8"N, 102°42'52.1"W	Oak forest	2350	De la Cerda 2785 (HUAA 51113)		
		Mesa Las Escobas, Sierra del Laurel, 21°46'15.63"N, 102°39'13.65"W	Oak forest	2400	García 4547 (HUAA 14245)		
QUERCUS	Aguascalientes	1.5 km E of Dam Los Alamos, Sierra del Laurel, 21°43'51.50"N, 102°41'57.58"W	Oak forest	2430	Rosales 3853 (HUAA 19950)		
		Calvillo	Cerro de la Mesilla, Sierra del Laurel, 21°43'30"N, 102°45'45"W	Pine-oak forest	2450	Rodríguez 288 (HUAA 9553)	
				Gully Oscura, N end of Sierra del Laurel, 21°46'40.6"N, 102°38'12.3"W.	Oak forest	2460	De la Cerda & García 1340 (HUAA 1124)
				Hondonada of Arroyo Ojocalientillo, 1 km N of Las Joyas, 21°45'16"N, 102°39'12"W	Pine-oak forest	2327	Martínez-Ramírez 1961 (HUAA 28602)
				Cerro de Los Gallos, 500 m NW of the antennae, 21°39'54"N, 102°13'5"W	Oak forest	2214	González 1393 (HUAA 21857)
				Hill La Loma (E of Malpaso)	Subtropical scrub	1800	De la Cerda & García 1115 (HUAA 11107)
				Mesa Las Escobas, Sierra del Laurel, 21°46'15.63"N, 102°39'13.65"W	Oak forest	2400	García 4559 (HUAA 14260)
				Gully, 1 km SE of Colomos, 21°52'31"N, 102°39'10"W	Subtropical scrub	2000	De la Cerda 7359 (HUAA 21625)
				2 km SW of Dam El Sálate	Temperate scrub	1900	De la Cerda 7374 (HUAA 21624)
				11.5 km SE of Malpaso	Subtropical scrub-oak	2280	De la Cerda 3839 (HUAA 13946)

Continued

Table 1. Continued.

Section/species	Municipality	Localities	Plant communities	Elevation (m)	Voucher
	Jesús María	Gully Oscura, SE of Rancho Boca Oscura, 21°46'33"N, 102°38'15"W	Oak forest	2354	Martínez-Ramírez 1931 (HUAA 28566)
		8 km SW of Hacienda El Garabato	Relict oak forest	2010	De la Cerdá 3480 (HUAA 8183)
		SW of Los Arquitos Dam	Gallery forest	1910	De la Cerdá 6512 (HUAA 16450)
		2.5 km SW of Dam San Rafael to SE	Pine-oak forest	2050	Vega 186 (HUAA 4065)
		Arroyo La Gloria, 21°55'13.9"N, 102°25'09.8"W	Vestigial oak forest	1800	Rodríguez 2 (HUAA 8210)
		Canyon of Abelardo Rodríguez Dam, Arroyo La Gloria, 22°55'13.38"N, 102°24'06.06"W	Gallery forest	2910	González 1254 (HUAA 28787)
	Pabellón de Arteaga	Hill W of El Garabato, 22°04'15.34"N, 102°22'30.86"W	Vestigial oak forest	2050	Rosales 3230 (HUAA 28710)
	Rincón de Romos	Gully Pabellón de Hidalgo, 22°11'30.01"N, 102°21'06.98"W	Temperate scrub	2018	González 1318 (HUAA 22143)
	San José de Gracia	Dam Jocoqui, 22°08'04.5"N, 102°22'55.4"W	Vestigial oak forest	1950	De la Cerdá 6358 (HUAA 16297)
		Gully Túnel de Potrerillos, 22°4'04"N, 102°26'09"W	Gallery forest	2050	De la Cerdá 6495 (HUAA 16403)
		4.5 km SW of Paredes	Temperate scrub-oak	2150	De la Cerdá 6126 (HUAA 15284)
		3 km SW of La Estancia, 22°08'5.8"N, 102°22'16.6"W	Oak forest	2150	García 2205 (HUAA 23552)
		2 km SW of Paredes, 22°08'23"N, 102°30'10"W	grassland-temperate scrub	2100	De la Cerdá 7534 (HUAA 21766)
		Gully Los Planes	Pine-oak forest	2300	De la Cerdá 2768 (HUAA 5239)
		Gully Piletas, Sierra San Blas de Pabellón	Pine-oak forest	2500	García 1770 (HUAA 5878)
		Agua Zarca Biological Station (EBAZ), 22°05'40.25"N, 102°33'23.44"W	Oak forest	2200	Rosales 1754 (HUAA 21318)
		1.5 km NE of Rancho Viejo, 22°06'56.3"N, 102°30'19.8"W	Oak forest-Temperate scrub	2038	Martínez-Calderón 60 (HUAA 29914)
<i>Q. depressipes</i> Trel.	Calvillo	Km SE of Mesa Grande, 21°46'40.7"N, 102°46'56.3"W	Subtropical scrub	1900	Martínez-Ramírez 2377 (HUAA 29915)
	Pabellón de Arteaga	7.7 km SW of El Garabato, 22°04'21"N, 102°24'51"W	Pine-oak forest	2244	Martínez-Ramírez 2303 (HUAA 29916)
	San José de Gracia	Agua Zarca Biological Station 22°05'41"N, 102°33'10"W	Oak forest	2177	González 1142 (HUAA 21781)
<i>Q. deserticola</i> Trel.	Jesús María	Potrero del Río, 2.5 km NW of Tapias Viejas, 21°51'24"N, 102°33'28"W	Temperate scrub	1910	Martínez-Ramírez 1528 (HUAA 19917)
<i>Q. greggii</i> (A. DC.) Trel.*	San José de Gracia	1 km SE of Agua Escondida, 22°11'02"N, 102°37'19"W	Pine forest	2621	Martínez-Ramírez 1993 (HUAA 29924)
<i>Q. grisea</i> Liebm.	Aguascalientes	Cerro los Gallos, 21°39'49"N, 102°13'32"W	Oak forest	2100	De la Cerdá s/n. (HUAA 42)
	Calvillo	La Trinchepa, 4 km N of Terrero del Refugio, 21°55'17.94"N, 102°30'42.22"W	Oak forest	2380	Martínez-Ramírez 1700 (HUAA 29421)
		Hillside N of El Montoro	Pine-oak forest	2410	De la Cerdá & García 1164 (HUAA 7014)
		Hillside N of Cañada Arroyo Pinito, 22°21'12"N, 102°20'21"W	Oak forest	2325	De la Cerdá & García 1402 (HUAA 3382)
	Jesús María	2.6 km E of Milpillas de Arriba, 21°56'04.0"N, 102°31'41.8"W	Temperate grassland	2146	Martínez-Calderón 68 (HUAA 29925)
		Canyon Dam Abelardo Rodríguez, Arroyo La Gloria, 22°55'13.38"N, 102°24'06.06"W	Gallery forest	2860	González & Rosales 1255 (HUAA 28786)
		Gully of Las Palomas, Sierra Brava, 22°01'23"N, 102°32'30"W	Oak forest	2300	González & Rosales 1215 (HUAA 28668)
	Rincón de Romos	Gully Juan Caporal, 22°15'26"N, 102°26'50.2"W	Oak forest	2112	De la Cerdá 4697 (HUAA 20039)
	San José de Gracia	NW of Congoja, Sierra Fria, 22°11'22"N, 102°34'19"W	Pine-oak forest	2500	Loera et al. 3 (HUAA 23464)
		Gully Piletas, 22°11'31.42"N, 102°36'17.03"W	Grassland-pine-oak forest	2500	García 1790 (HUAA 5962)
		Rancho El Zepo (Sierra Fria), 22°11'04.55"N, 102°35'49.29"W	Oak forest	2570	De la Cerdá s/n (HUAA 76)
		Path to Dam of La Araña, 22°13'35.73"N, 102°37'15.42"W	Pine-oak forest	2350	De la Cerdá s/n (HUAA 1986)
		2 km SE of Paredes, 22°08'23"N, 102°30'10"W	Grassland-oak forest	2100	De la Cerdá 7533 (HUAA 21744)
		Around La Congoja, 22°09'38.29"N, 102°33'17.41"W	Oak forest	2494	González 1107 (HUAA 21777)
		Agua Zarca Biological Station, 22°05'35.58"N, 102°33'17.41"W	Pine-oak forest	2400	Rosales 1755 (HUAA 21319)
		Los Alamos, 22°10'56"N, 102°36'39"W	Pine-oak forest	2574	Martínez-Ramírez 1340 (HUAA 21118)
		Gully Río Blanco (path to Cerro de la Ardilla)	Pine-oak forest	2350	García s/n (HUAA 70)
		road to La Congoja, 1 km W of La Congoja, 22°09'40.7"N, 102°32'55.1"W	Oak forest	2497	López 21 (HUAA 19534)
		Gully "El Chupadero"	Oak forest	2400	García 2274 (HUAA 5049)
		3 km SE of Gully del Tiznado	Oak forest	2300	Gutiérrez 98 (HUAA 5602)

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Table 1. Continued.

Section/species	Municipality	Localities	Plant communities	Elevation (m)	Voucher
<i>Q. laeta</i> Liebm.	Aguascalientes	Gully Los Planes, 22°3'14.56" N, 102°29'42.33" W	Pine-oak forest	2300	De la Cerda 2769 (HUAA 5205)
		Gully El Rico, 5.7 km NW of La Congoja, 22°12'50.68" N, 102°34'21.13" W	Pine-oak forest	2400	Martínez-Calderón 99 (HUAA 29926)
		Cima del Cerro Los Azules, hillside N, 21°59'40" N, 102°29'16" W	Oak forest	2564	Martínez-Ramírez 2095 (HUAA 28788)
	Calvillo	Hillside W of Cerro del Picacho, 21°53'27.51" N, 102°25'23.65" W	Thorny scrub-subtropical scrub	2100	García 2609 (HUAA 7048)
		Hillside S of Cerro del Picacho, 21°53'02" N, 102°25'02" W	Oak forest-grassland	1900	García 2610 (HUAA 6794)
		Cerro Los Gallos, 21°39'49" N, 102°13'22" W	Oak forest	2256	Rosales 3865 (HUAA 23537)
		1 km NW of Ignacio Zaragoza, 21°51'41.2" N, 102°27'32" W	Temperate scrub	2000	De la Cerda 6084 (HUAA 18242)
		Cerro Los Gallos, 21°40'50.4" N, 102°12'45.4" W	Temperate scrub with oak	2100	De la Cerda 6039 (HUAA 15282)
		1 km NE of El Ocote, 21°47'13.58" N, 102°31'38.16" W	Oak forest	2000	García 2637 (HUAA 6409)
		Palo Alto	Subtropical scrub	2200	De la Cerda & García 1372 (HUAA 1284)
		Gully Oscura, Sierra del Laurel, 21°46'40" N, 102°38'12" W	Oak forest	2242	González 1993 (HUAA 28715)
		2 km W of EL Garruño, 21°44'22" N, 102°43'30" W	Oak forest	2120	Martínez-Ramírez 1568 (HUAA 29460)
		1.5 km NE of El Sauz, 21°52'57.25" N, 102°36'7.05" W	Oak forest	2019	De la Cerda 6558 (HUAA 16462)
		5 km NW of El Terrero	Temperate grassland	2400	De la Cerda & García 1536 (HUAA 29011)
		2 km NE of Palo Alto	Tropical forest-oak forest	1900	García 2517 (HUAA 16698)
S of Los Alisos, Sierra del Laurel	Oak forest	2100	García 4973 (HUAA 17197)		
Los Alisos, 21°44'51.2" N, 102°43'65.7" W	Tropical forest-oak forest	2100	De la Cerda 6164 (HUAA 15287)		
La Cienega 21°44.123" N, 102° 42.178" W	Oak forest	2380	González 299 (HUAA 19351)		
2.5 km NE of Palo Alto	Subtropical scrub	1900	García 2517 (HUAA 6413)		
Jesús María	1 km W of El Garruño, 21°44'27.0" N, 102°43'32.8" W	Oak forest-subtropical scrub	2084	Martínez-Calderón 69 (HUAA 29927)	
	2 km SE of Dam Capulín, 21°49'48" N, 102°33'58" W	Pine-oak forest	2000	Vega 105 (HUAA 4067)	
	Mesa del Pino	Oak forest	2100	García 2194 (HUAA 5153)	
	1.5 km NE of Dam Chichimeo	Thorny scrub-oak	2100	Vega 246 (HUAA 4073)	
	Ravine between Tapias Viejas and El Ocote, 21°48'10" N, 102°31'07" W	Temperate scrub	2000	García 5208 (HUAA 23087)	
	12 km S of crossroads Calvillo-Tapias Viejas	Temperate scrub with oak	2100	De la Cerda 5765 (HUAA 13206)	
	"Km 4", highway between Tapias-El Ocote	Thorny scrub	1800	García 2752 (HUAA 5086)	
	2.5 km W of Rinconcito Lejano	Thorny scrub-oak	2300	Vega 12 (HUAA 4074)	
	1 km SW of Gracias a Dios	Temperate scrub-oak	2300	Vega 37 (HUAA 4075)	
	2 km N of Milpillas de Abajo	Thorny scrub-oak	2350	Vega 202 (HUAA 4083)	
	2.6 km E of Milpillas de Arriba, 21°56'04.0" N, 102°31'41.8" W	Grassland-thorn scrub	2200	Martínez-Calderón 67 (HUAA 29928)	
	Dam Abelardo Rodríguez, Steam La Gloria, 22°55'13.38" N, 102°24'06.06" W	Gallery forest	2910	González & Rosales 1256 (HUAA 28785)	
	7.7 km SW of El Garabato, 22°04'21.2" N, 102°24'51.9" W	Pine-oak forest	2244	Martínez-Ramírez 2704 (HUAA 29929)	
	San José de Gracia	SW of Dam la Araña, 22°13'40.70" N, 102°37'21.80" W	Pine-oak forest	2580	De la Cerda & García 1263 (HUAA 4151)
		7.7 km N of El Temazcal, 22°04'01.55" N, 102°43'54.31" W	Oak forest	2530	Adame & Rosales 1166 (HUAA 21838)
Ranch El Sinai		Oak forest	2691	González & Rosales 1181 (HUAA 21830)	
Peñón Blanco 3.5 km E of La Congoja, 22°10'15.36" N, 102°31'17.24" W		Oak forest	2304	González 1102 (HUAA 21774)	
3 km NW of El Temazcal, 22°01'28.30" N, 102°44'14.72" W		Oak forest	2162	González & Rosales 1151 (HUAA 21775)	
Agua Zarca Biological Station 22°05'35.58" N, 102°33'17.41" W		Oak forest	2142	González 1146 (HUAA 16557)	
10 km W of La Congoja, 22°09'45.26" N, 102°39'07.23" W		Pine-oak forest	2530	García s/n (HUAA 53)	
9 km W of San Antonio de los Ríos		Temperate scrub-oak	2270	De la Cerda 2483 (HUAA 4285)	

Continued

Table 1. Continued.

Section/species	Municipality	Localities	Plant communities	Elevation (m)	Voucher
<i>Q. magnoliifolia</i> Née*	Calvillo	Glen on hillside W of Cerro del Pinal, 22°04'11"N, 102°43'37"W	Oak forest	2541	Martínez-Ramírez 168 (HUAA 29931)
		Gully La Botita, 4 km SE of Malpaso, 21°49'44.7"N, 102°38'33.7"W	Oak forest with elements of subtropical scrub	1670	Martínez-Calderón 103 (HUAA 29932)
<i>Q. obtusata</i> Humb. & Bonpl.*	Calvillo	Cerro del Laurel	Oak forest	2400	García 1312 (HUAA 11839)
		Hondonada of Arroyo Ojocalientillo, 1 km N of Las Joyas, 21°45'16"N, 102°39'12"W	Oak forest	2327	Martínez-Ramírez 1965 (HUAA 28606)
		Gully Oscura, 0.5 km E of Rancho Boca Oscura, 21°46'37"N, 102°38'09"W	Oak forest with elements of cloud forest	2256	Martínez-Ramírez 1927 (HUAA 28570)
		Arroyo Ojocalientillo, 1 km N of Las Joyas, 21°45'16"N, 102°39'12"W	Oak forest	2327	Martínez-Ramírez 1966 (HUAA 29379)
	San José de Gracia	La Angostura, 22°5'24.5"N, 102°41'31.9"W	Oak forest	2702	Romo 167 (HUAA 19850)
		Cañada El Carrizal, NW of Paredes, 22°10'59"N, 102°30'13"W	Oak forest,	2100	De la Cerda 7385 (HUAA 20465)
<i>Q. potosina</i> Trell.	Aguascalientes	Cerro El Picacho, W hillside, 21°53'27.51"N, 102°25'23.65"W	Oak forest	2100	García 2603 (HUAA 6510)
		Hillside NW of Cerro del Picacho, 21°53'27.51"N, 102°25'23.65"W	Oak forest	2150	De la Cerda & García 1014 (HUAA 11114)
		Cerro de Los Gallos, 21°39'49"N, 102°13'32"W	Oak forest	2256	Rosales 3864 (HUAA 23538)
	Asientos	1 km NE of Ojo de Agua de Crucitas	Temperate scrub	2100	García 2953 (HUAA 16697)
		Cañada El Saucillo, 22°14'49.53"N, 102°6'46.32"W	Oak forest	2257	Rosales 1785 (HUAA 19597)
	Calvillo	Rancho Los Carrizos, 21°45'0.4"N, 102°42'4.4"W	Oak forest	2350	García 5380 (HUAA 22077)
		Los Alisos, 21°44'29"N, 102°43'42"W	Tropical deciduous forest-oak forest	2035	Rosales 3804 (HUAA 23064)
		El Pilar, Sierra San Blas de Pabellón, 22°03'52.05"N 102°43'46.35"W	Oak forest	2700	García 1758 (HUAA 16686)
		Hillside E of Cerro de la Mesilla, Sierra del Laurel,	Pine-oak forest	2400	Rodríguez 286 (HUAA 9551)
		Hillside E, Gully El Pilar, 22°03'49"N, 102°44'16.93"W	Oak forest	2400	Martínez-Ramírez 1674 (HUAA 29393)
		Gully Oscura, Sierra del Laurel, 21°46'40.6"N, 102°38'12.3"W	Oak forest	2242	González 1191 (28803)
		El Montoro	Pine-oak forest	2410	De la Cerda & García s/n (HUAA 1111)
		Arroyo El Ocote, 3 km NE of El Terrero, Sierra del Pinal	Oak forest	2300	Rodríguez 600 (HUAA 12128)
	La Cienega		Oak forest	2300	García 2560 (HUAA 6538)
		2 km NW of El Terrero del Refugio, 21°52'48.75"N, 102°51'22.03"W	Oak forest	2280	De la Cerda 5829 (HUAA 13191)
		11.5 km SE of Malpaso	Subtropical scrub-oak forest	2280	García 3833 (HUAA 13977)
	Cosío	Cañada Arroyo Pinito, N hillside, 22°21'12"N, 102°20'21"W	Oak forest	2325	De la Cerda & García 1403 (HUAA 3381)
	El Llano	W hillside, Cerro Juan El Grande, 21°56'22.53"N, 101°55'13.68"W	Oak forest	2200	De la Cerda 6649 (HUAA 16589)
	Jesús María	1 km NW of Cerro del Colorín (Sierra de Guajolotes)	Chaparral with oak-Pine	2500	Rodríguez & Soto 2 (HUAA 7809)
		Dam El Capulín	Oak forest	2100	De la Cerda & García 1429
		Cerro La Chivera	Oak forest	2320	De la Cerda & García 1153 (HUAA 1113)
		Gully El Pino	Temperate scrub	2500	De la Cerda 3089 (HUAA 6718)
		2 km N of Gracias a Dios, 21°56'37.50"N, 102°29'23.49"W	Temperate scrub-oak	2100	Vega 48 (HUAA 4076)
		2 km N of Milpillas de Abajo, 21°57'16.62"N, 102°33'07.80"W	Temperate scrub-oak	2350	Vega 204 (HUAA 4081)
	San José de Gracia	10 km W of La Congoja, 22°09'45.26"N, 102°39'07.23"W	Pine-oak forest	2530	García s/n (HUAA 58)
		Gully Piletas, Sierra Fria, 22°11'31.42"N, 102°36'17.03"W	Pine-oak forest	2450	De la Cerda 485 (HUAA 6957)
		Agua Zarca Biological Station, 22°05'35.58"N, 102°33'17.41"W	Oak forest	2339	Rosales 1597 (HUAA 23028)
		Cerro de la Ardilla, 22°16'41.1"N, 102°35'13.6"W	Pine-oak forest	2800	Villalobos 3 (HUAA 11661)
		Dam La Araña, 22°13'40.70"N, 102°37'21.80"W	Oak forest	2580	García 1264 (HUAA 4150)
		4 km NE of Gully de Piletas	Pine-oak forest	2400	Gutiérrez 44 (HUAA 5472)
		Gully Río Blanco (path to Cerro de La Ardilla)	Pine-oak forest	2350	García s/n (HUAA 69)

Continued

Table 1. Continued.

Section/species	Municipality	Localities	Plant communities	Elevation (m)	Voucher
<i>Q. praecox</i> Trel.* <i>Q. repanda</i> Humb. & Bonpl.*	Gully Las Cazuelas	Gully El Rico, 22°12'50.68"N, 102°34'21.13"W	Pine-oak forest	2500	Cuellar et al. 44 (HUA 8764)
		Cañada "Agua Escondida", 22°11'38.8"N, 102°38'06.2"W	Pine-oak forest	2500	García 2457 (HUA 6134)
		Playa Mariquitas, Monte Grande Sierra Fría, 22°14'48"N, 102°38'24"W	Pine-oak forest	2693	López 32 (HUA 19526)
		Brecha al Alamo, Cerro El Primo, Monte Grande Sierra Fría, 22°15'51"N, 102°37'45"W	Oak forest	2863	Siqueiros 4687 (HUA 19935)
		Mesa Alta, Monte Grande Sierra Fría	Oak forest	2867	Siqueiros 4672 (HUA 19930)
		Gully Laguna Seca	Oak forest	2973	Siqueiros 4675 (HUA 20043)
		100 m W of El Zepo, 22°11'04.55"N, 102°35'49.29"W	Pine-oak forest	2450	Gutiérrez 52 (HUA 5471)
		8.5 km NW of La Congoja Sierra Fría, 22°13'32.75"N, 102°36'44.26"W	Pine-oak forest	2600	De la Cerda 2428 (HUA 4276)
		Peñón Blanco, 3.5 km E of La Congoja, 22°10'15.36"N, 102°31'17.24"W	Pine-oak-chaparral forest	2614	Sabás et al. 12 (HUA 23586)
		Forest station, Sierra Fría	Oak forest	2304	González 1105 (HUA 21773)
	Tepezalá	0.3 km SW of Laguna Seca, 21°11'11.67"N, 102°38'11.30"W	Oak forest	2583	Adame-Rosales 1176 (HUA 21820)
		Cabañas Las Manzanillas, 1.99 km NW of El Zepo, 22°11'31.38"N, 102°36'47.64"W	Pine-oak forest	2698	González 1117 (HUA 21791)
		Ranch El Sinal	Oak forest	2609	González 1112 (HUA 21797)
		0.5 km NE of Laguna Seca	Oak forest	1691	González & Rosales 1178 (HUA 21829)
		Gully Los Planes, 22°3'14.56"N, 102°29'42.33"W	Oak forest	2698	González & Rosales 1187 (HUA 21839)
		Gully "El Chupadero"	Pine forest	2400	García 2134 (HUA 5576)
		Gully de Juan Francisco; Sierra San Blas de Pabelón, 22°12'18.9"N, 102°37'35.2"W	Oak forest	2400	García 2270 (HUA 4986)
		Gully Pino	Pine-oak forest	2600	García 2292 (HUA 6023)
		Gully La Boquilla, 1 km E of Rancho Las Camas	Oak forest	2100	De la Cerda 5592 (HUA 12213)
		Gully La Minerva	Oak forest	2140	De la Cerda & García 587 (HUA 21879)
Calvillo	Around of Dam Los Alamitos, 21°43'55"N, 102°42'50"W	Temperate scrub with oak	2500	Rosales 10 (HUA 1028)	
	Waterfall of Gully Boca Oscura, 21°46'28"N, 102°38'14"W	Oak forest	2360	De la Cerda 7457 (HUA 20918)	
	0.5 km S of Mesa del Roble, 21°44'51"N, 102°45'17"W	Oak forest with elements of cloud forest	2332	Martínez-Ramírez 1588 (HUA 29447)	
	Gully Pabelón de Hidalgo, 22°13'08"N, 102°22'12"W	Oak forest	1928	Martínez-Ramírez 1561 (HUA 29454)	
	2.3 km NW of Dam Los Alamitos, 21°44'80.6"N, 102°41'09"W	Temperate shrub	2018	González 1319 (HUA 21853)	
	Puerto Piñones	Oak forest	2350	Martínez-Ramírez 2640 (HUA 29933)	
	Gully Los Planes, Sierra de Guajolotes	Pine-oak forest	2600	De la Cerda 4788 (HUA 13185)	
	Los Alamitos, Sierra Fría, 22°10'56"N, 102°36'39"W	Oak forest	2250	García 2335 (HUA 5287)	
	Rancho El Zepo (Sierra Fría), 22°11'04.55"N, 102°35'49.29"W	Pine-oak forest	2574	Martínez-Ramírez 1341 (HUA 21111)	
	0.5 km E of La Congoja	Oak forest	2750	De la Cerda & García 279 (HUA 73)	
Aguascalientes	Bajío La Canoa, 3 km W of La Congoja, 22°10'13"N, 102°34'58"W	Oak forest	2480	De la Cerda 2490 (HUA 4593)	
	1 km SE of Agua Escondida, 22°11'02"N, 102°37'19"W	Temperate grassland	2550	De la Cerda 7563 (HUA 21801)	
	Cañada Mesa Montoro, 22°00'12"N, 102°33'52"W	Coniferous forest	2621	Martínez-Ramírez 1991 (HUA 28577)	
	El Jaquay	Oak forest-grassland	2436	De la Cerda 6548 (HUA 16467)	
	NW slope of Cerro del Picacho, 21°53'27.51"N, 102°25'23.65"W	Pine-oak forest	2610	De la Cerda & García 1149 (HUA 3826)	
	1 km W of Ignacio Zaragoza, path to Cerro del Muerto, 21°51'41.2"N, 102°27'32"W	Oak forest	1980	De la Cerda & García 1001 (HUA 80)	
	Hill Los Gallos, 500 m NW of antennae, 21°39'54"N, 102°13'15"W,	Temperate scrub	2050	De la Cerda 6082 (HUA 14637)	
	El Ocote, 21°47'60"N, 102°31'57"W	Oak forest	2214	González 1392 (HUA 21852)	
	2 km NW of El Ocote, 21°47'40.8"N, 102°31'49.9"W	Vestigial oak forest	2020	González & Lucio 700 (HUA 19709)	
		Temperate scrub	1950	Martínez-Calderón 84 (HUA 29934)	

Continued

Table 1. Continued.

Section/species	Municipality	Localities	Plant communities	Elevation (m)	Voucher
<i>Q. rugosa</i> Née	Calvillo	Hillside E of Cerro de la Mesilla, Sierra del Laurel	Pine-oak forest	2470	Rodríguez 291 (HUAA 9556)
		Gully Tortugas	Subtropical scrub	1800	De la Cerda & García 1667 (HUAA 1032)
		Gully La Botita. 4 km SE of Malpaso, 21°49'12.6"N, 102°38'40.0"W	Oak forest with elements of subtropical scrub,	1670	Martínez-Calderón 105 (HUAA 29935)
El Llano	Jesús María	Cerro Juan Grande, E of Palo Alto, 21°56'4.34"N, 101°54'32.87"W	Oak forest	2150	De la Cerda & García 1230 (HUAA 1123)
		2 km SE of Dam Capullín, 21°49'48"N, 102°33'58"W	Pine-oak forest	2000	Vega 92 (HUAA 4063)
		1.5 km SW of Dam San Rafael	Temperate scrub-oak	2050	Vega 197 (HUAA 4091)
San José de Gracia	Calvillo	Laguna Seca, Sierra San Blas de Pabellón	Oak forest	2630	Gutiérrez 10 (HUAA 5469)
		1 km E of La Congoja	Temperate grassland	2600	De la Cerda 2433 (HUAA 4288)
		Agua Zarca Biological Station, 22°05'35.58"N, 102°33'17.41"W	Oak forest	2200	Rosales 1482 (HUAA 16577)
		3 km NW of El Temazcal, 22°01'28.3"N, 102°44'14.72"W	Oak forest	2162	González & Rosales 1153 (HUAA 1153)
		Los Alisos, 21°44'29"N, 102°43'42"W	Oak forest with elements of tropical forest	2035	Rosales 3808 (HUAA 23068)
<i>Q. striatula</i> Trel.*	Calvillo	Gully Boca Oscura, 21°46'36"N, 102°38'25"W	Oak forest with elements of tropical forest	2200	De la Cerda 7012 (HUAA 16811)
		El Pilar, 22°03'49.27"N, 102°44'10.93"W	Oak forest	2700	García 1759 (HUAA 7037)
		Los Alamos, 21°43'64"N, 102°42'82"W	Oak forest	2300	De la Cerda 6300 (HUAA 16446)
		Stream El Mirador, 4 km W of Los Miradores	Oak forest	2344	Martínez-Ramírez 1956 (HUAA 29564)
		6.44 km SW of Zepo, 21°10'58.94"N, 102°35'48.9"W	Oak forest	2618	González 1135 (HUAA 21784)
		Agua Zarca Biological Station (EBAZ), 22°05'35.38"N, 102°33'17.41"W	Oak forest	2200	Rosales 1752 (HUAA 21329)
		8.11 km N of Temazcal, 22°04'37.25"N, 102°43'28.50"W	Oak forest	2556	Adame-Rosales 1172 (HUAA 21823)
		Forest station, Sierra Fría	Oak forest	2583	Adame-Rosales 1175 (HUAA 21825)
		Gully La Boquilla, 1 km E of Rancho Las Camas	Oak forest	2140	De la Cerda & García 587 (HUAA 21878)
		Cañada El Carrizal, NW of Paredes, 22°10'59"N, 102°30'13"W	Oak forest	2100	De la Cerda 7386 (HUAA 20464)
		Mesa Alta, Monte Grande, Sierra Fría,	Oak forest	2973	Siqueiros 4061 (HUAA 4678)
		4 km SW of La Congoja, 22°09'04"N, 102°35'38"W	Oak forest	2600	De la Cerda 6276 (HUAA 15182)
Rincón de Romos	San José de Gracia	Cerro "La Culebra"	Oak forest	2350	De la Cerda 2774a (HUAA 5032)
		4 km W of Jagüey	Oak forest	2530	De la Cerda & García 1079 (HUAA 1127)
		1.5 km SW of Gully de Vallecitos	Pine-oak forest	2448	Gutiérrez 77 (HUAA 5728)
Calvillo	Calvillo	Gully El Rico. 5.7 km NW of La Congoja, 22°12'50.68"N, 102°34'21.13"W	Oak forest	2404	Martínez-Calderón 98 (HUAA 29936)
		Gully Juan Caporal, 22°15'26"N, 102°26'50.2"W	Oak forest	2112	Siqueiros 4696 (HUAA 20047)
		Los Alamos, 7 km W of La Congoja, 22°10'01"N, 102°39'39"W	Pine-oak forest	2574	De la Cerda 7571 (HUAA 21813)
		8 km S of Tapias Viejas, Sierra del Laurel	Oak forest	2150	García 4506 (HUAA 13986)

Quercus castanea Née. Figure 4C.

Quercus castanea NÉE (1801): 276. — GONZÁLEZ (1986): 40.
Q. circummontana TRELEASE (1924): 177. — GONZÁLEZ (1986): 40.
Q. rossii TRELEASE (1924): 179. — GONZÁLEZ (1986): 40.
Q. serrulata TRELEASE (1924): 179. — GONZÁLEZ (1986): 40.

Material examined: Table 1.

Tree of 10–15 m high. Leaf coriaceous of 3.5–11 × 1.2–7.5 cm, oblanceolate, with 2–9 awns at the leaf margin rarely entire, apex acute or rounded, ending in awn, upper surface lustrous and glabrescent with imprinted veins, undersurface whitish or yellowish, tomentose, base subcordate to rounded. Fruit biannual, cupule hemispherical, nut broadly ovoid 10–12 × 8–10 mm.

In México, this species is distributed in the states of Aguascalientes, Colima, Durango, Distrito Federal, Guanajuato, Guerrero, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, San Luis Potosí, Sinaloa, Sonora, Puebla, Oaxaca, and Veracruz. In Aguascalientes, it is found in the municipalities of Calvillo, Jesús María and San José de Gracia, in oak forest and manzanita shrubs, from 2000–2695 m.

Quercus chihuahuensis Trel. Figure 4D

Quercus chihuahuensis TRELEASE (1924): 129–131. — GONZÁLEZ (1986): 48.
Q. jaliscensis TRELEASE (1924): 132. — GONZÁLEZ (1986): 48.

Material examined: Table 1.

Tree of 3–6 m high. Branchlets pubescent. Leaf coriaceous of (2)4–8(–12) × (1)2–4(–6) cm, obovate, oblong-obovate or elliptic, with mucronate or entire margin and apex obtuse or rounded, ending in mucrone, upper surface and lower surface both tomentose, base cordate, subcordate or rounded. Fruit annual, cupule hemispherical with margin entire, nut ovoid 13–20 × 8–13 mm.

In México, distributed in the states of Aguascalientes, Chihuahua, Durango, Jalisco, Nayarit, Nuevo León, San Luis Potosí, Sinaloa, Sonora, and Zacatecas. In Aguascalientes, it has been found in the municipalities of Aguascalientes, Calvillo, Jesús María, San José de Gracia, Rincón de Romos, and Pabellón de Arteaga, in oak, oak-pine, shrub, and grasslands from 1800–2900 m. It can be confused with *Q. deserticola*, however, *Q. deserticola* has imprinted vein pattern and more revolute leaf margins.

Quercus depressipes Trel. Figure 4E.

Quercus depressipes TRELEASE (1924): 144. — McVAUGH (1974): 32; GONZÁLEZ (1986): 75.

Material examined: Table 1.

Shrub of 0.80–1.5 m high. Leaf of (1)2.5–4(5) × (0.6)1–2(2.5) cm, oblong or obovate, with 3–5 mucronate teeth at the leaf margin, apex rounded or subacute, ending in mucrone, base cordate and sometimes round. It is easily distinguished in the field by its shrubby habit and glabrous leaves.

Distributed from west Texas to México, in the states of Aguascalientes, Chihuahua, Durango, Jalisco, and Zacatecas. In Aguascalientes, it has been found in the municipalities of Calvillo, Pabellón de Arteaga, and San José de Gracia, in oak forest, oak-pine forests, and is sometimes associated

with thorny or subtropical shrubland from 1900–2244 m. *Quercus depressipes* can form dense clumps of growth that are difficult to penetrate. It is easily distinguished in the field by its shrubby habit and glabrous leaves.

Quercus deserticola Trel. Figure 4F

Quercus deserticola TRELEASE (1924): 79. — McVAUGH (1974): 33; GONZÁLEZ (1986): 78.

Material examined: Table 1.

Tree up to 7 m high. Branchlets yellow-tomentose. Leaf coriaceous of (3.5)4.5–8.5(9.5) × (2.5)3–6(7) cm, oblong-oblanceolate or oblong-elliptic, with 5–7 mucronate teeth at the leaf margin, lobed and revolute, apex obtuse or rounded ending in mucrone, upper surface with veins impressed, upper surface and lower surface both tomentose, base cordate or rounded. Fruit annual, cupule hemispherical with margin entire, nut widely-ovoid 12–48 × 10–15 mm.

In México, the species is distributed in the states of Aguascalientes, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Oaxaca, Puebla, Querétaro and Sinaloa. In Aguascalientes, it has been found in the municipality of Jesús María; associated with shrublands at 1910 m. *Quercus deserticola* is similar to *Q. chihuahuensis* (see comments in *Q. chihuahuensis*).

Quercus durifolia Seemen. Figure 4G

Quercus durifolia SEEMEN (1900): 95. — SPELLENBERG et al. (1998): 371.

Material examined: Table 1.

Tree of 8 m high. Leaf coriaceous of 2.5–5 × 1–2.3 cm, elliptic or lanceolate, with entire margin, apex acute or obtuse ending in awn, upper surface lustrous and glabrescent, lower surface whitish tomentose that hides the bullate epidermis, base cordate or rounded. Fruit annual, cupule hemispherical with pubescent scales except near the apex, nut ovoid 18 × 10 mm.

In México, the species is distributed in the states of Aguascalientes, Chihuahua, Durango, Sinaloa and Sonora. In Aguascalientes, it was only found in the municipality of San José de Gracia in oak and oak-pine forests from 2400–2839 m. The diagnostic character of the species is an entire leaf margin with whitish underside of the leaf that contrasts with the dark-green upper side.

Quercus eduardi Trel. Figure 4H.

Quercus eduardi TRELEASE (1922): 189. — McVAUGH (1974): 35; GONZÁLEZ (1986): 82.

Material examined: Table 1.

Tree of 4–8 m high. In the field, it may be identified by the pubescent underside of the leaf that can be removed easily by rubbing; usually there are awns present on the leaf margin. However, there are some individuals with entire leaf margins, which can be confused with *Q. mexicana*. The leaf venation is not as evident as in *Q. eduardi*, which helps in differentiating the two species.

In México, the species is distributed in the states of Aguascalientes, Durango, Jalisco, Guanajuato, Nayarit,



Figure 4. **A.** *Quercus aristata* from Presa los Alamitos, Sierra del Laurel, Calvillo. **B.** *Quercus candicans* from Barranca Oscura, Calvillo. **C.** *Quercus castanea* from Barranca El Huarache 1.72 km NW de El Terrero del Refugio, Calvillo. **D.** *Quercus Chihuahuensis* from Barranca El Calderón, San José de Gracia. **E.** *Quercus deserticola* from Potrero del Rio, Jesús María. **F.** *Quercus depressipes* from Agua Zarca, San José de Gracia. **G.** *Quercus durifolia* from Barranca El Calderón, San José de Gracia. **H.** *Quercus eduardi* from Barranca El Calderón, San José de Gracia.

Querétaro, San Luis Potosí and Zacatecas. In Aguascalientes, it has been found in the municipalities of Aguascalientes, Calvillo, Jesús María, Pabellón de Arteaga, Rincón de Romos and San José de Gracia in oak, oak-pine, and juniper forests, grasslands and shrublands, from 1530–2618 m.

Quercus gentryi C.H. Mull. Figure 5A.

Quercus gentryi MULLER (1942): 474. — McVAUGH (1974): 43; GONZÁLEZ (1986): 99.

Material examined: Table 1.

Tree of 8–15 m high. Leaf of 3–13 × 1–3.5 cm, narrowly elliptic or lanceolate, with entire margin, apex acute or obtuse, ending in awn, upper surface lustrous and glabrescent, lower surface glabrous except for trichomas along of midvein and bases of the large lateral veins, base acute or attenuated. Fruit biannual, cupule hemispherical with thickened and inrolled border, nut broadly-ovoid 18 × 12 mm.

In México, the species is distributed in the states of Aguascalientes, Durango, Guanajuato, Jalisco, Michoacán, Nayarit, Sinaloa and Zacatecas. In Aguascalientes, it has been found in the municipalities of Calvillo and Jesús María in oak forests from 2084–2625 m. In the field, can be identified by its large size, narrowly elliptic leaves and entire leaf margins.

Quercus greggii Trel. Figure 5B.

Quercus greggii TRELEASE (1922): 185. — ROMERO et al. (2014): 64. *Q. reticulata* var. *greggii* DE CANDOLLE (1864): 34. — ROMERO et al. (2014): 64.

Material examined: Table 1.

Shrub of 1.50 m high. Branchlets pubescent. Leaf of 2.5–4.5 × 1.3–3 cm, obovate or oblong-obovate, with entire margin sometimes with 1–4 short-mucrone at the leaf margin, apex obtuse or rounded, ending in mucrone, upper surface glabrescent with imprinted veins, lower surface tomentose and yellowish, base cordate or rounded. Fruit annual, cupule hemispherical with margin entire, nut ovoid 13 × 10 mm.

In México, this shrubby species is distributed in the states of Aguascalientes, Coahuila, Durango, Hidalgo, Nayarit, Nuevo León, Oaxaca, Puebla, San Luis Potosí, Tamaulipas and Veracruz. In Aguascalientes, it has been found only in the municipality of San José de Gracia in oak-pine forest at 2621 m.

Quercus grisea Liebm. Figure 5C.

Quercus grisea LIEBMANN (1854): 171. — McVAUGH (1974): 48; GONZÁLEZ (1986): 112.

Material examined: Table 1.

Tree of 4–7 m high. Branchlets tomentose. Leaf subcoriaceous of (1)2–4(7) × (0.5)1–2(3) cm, elliptic, oblong-elliptic or obovate, with entire margin, rarely with mucrone, apex obtuse or rounded, ending in mucrone, base subcordate or rounded. In the field, can be identified by its small size, and its umbrella-like extended canopy, as well as by its gray foliage with entire leaf margin and pubescent leaves. Fruit

annual, cupule hemispherical, nut ovoid 12–18 × 8–12 mm.

Distributed from the southern USA to northern Mexico. In México, the species is found in the states of Aguascalientes, Chihuahua, Coahuila, Durango, Guanajuato, Jalisco, San Luis Potosí, Nuevo León, Sonora, Veracruz and Zacatecas. In Aguascalientes, it has been found in the municipalities of Aguascalientes, Calvillo, Cosío, Jesús María, San José de Gracia and Rincón de Romos in oak and pine-oak-juniper forests, usually associated with grasslands from 2100–2697 m.

Quercus jonesii Trel. Figure 5D.

Quercus jonesii TRELEASE (1924): 136. — McVAUGH (1974): 25; GONZÁLEZ (1986): 52.

Q. coccolobifolia TRELEASE (1924): 136. — GONZÁLEZ (1986): 52.

Q. endlichiana TRELEASE (1924): 141. — GONZÁLEZ (1986): 52.

Q. aerea TRELEASE (1924): 135. — GONZÁLEZ (1986): 52.

Material examined: Table 1.

Tree of 3–6 m high. Leaf coriaceous of (7)8–13(–18) × (5.5)7–15(–17) cm, broadly-obovate or suborbicular, entire margin or with 1–4 awns at the leaf margin, apex rounded, obtuse or apiculate, may end in awn or not, upper surface lustrous and glabrescent with imprinted veins, lower surface usually glabrous, base cordate or auriculate. Fruit annual, cupule hemispherical, nut ovoid 8–10 mm × 5–8 mm.

In México, the species is distributed in the states of Aguascalientes, Chihuahua, Durango, Guanajuato, Jalisco, Nayarit, San Luis Potosí and Sonora. In Aguascalientes, it has been found in the municipalities of Calvillo, Jesús María and San José de Gracia in limestone slopes in oak and pine-oak forests from 2400 to 2800 m. Always associated with *Pinus lumholtzii* Rob. et Fern .

Quercus laeta Liebm. Figure 5E

Quercus laeta LIEBMANN (1854): 179. — McVAUGH (1974): 50; GONZÁLEZ (1986): 119.

Q. obscura TRELEASE (1924): 71. — GONZÁLEZ (1986): 119.

Q. pallescens TRELEASE (1924): 89. — GONZÁLEZ (1986): 119.

Q. transmontana TRELEASE (1924): 71. — GONZÁLEZ (1986): 119.

Material examined: Table 1.

Tree of 3–8 m high. Branchlets tomentose or glabrescent. Leaf subcoriaceous of (2.5)4–8(–14) × (0.6)2–3(–7) cm, oblong-obovate, oblanceolate, elliptic or lanceolate, with 3–5 mucronate teeth at the leaf margin and revolute, apex obtuse, rounded or acute, ending in mucrone, upper surface glabrescent, lower surface glabrescent or pubescent, base cordate, rounded or oblique. Fruit annual, cupule hemispherical with margin entire, nut elliptic-ovoid 15 × 8 mm.

In México, the species is distributed in the states of Aguascalientes, Coahuila, Distrito Federal, Durango, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Nayarit, Nuevo León, Sinaloa, Oaxaca and Zacatecas. In Aguascalientes, it has been found in the municipalities of Aguascalientes, Calvillo, Jesús María, Pabellón de Arteaga and San José de Gracia, in oak, pine-oak, or pine forests, in temperate and subtropical shrublands and grasslands from 1900–2650 m. *Quercus*



Figure 5. *Quercus gentry* from 1 km W El Garruño, Calvillo. **B.** *Quercus greggii* from Agua Escondida, San José de Gracia. **C.** *Quercus grisea* from Milpillas de Arriba, Jesús María. **D.** *Quercus jonesii* from Monte Grande Sierra Fría, San José de Gracia. **E.** *Quercus laeta* from Barranca La Botita, Calvillo. **F.** *Quercus laurina* from Cerro El Pujido, San José de Gracia. **G.** *Quercus magnoliifolia* from Barranca La Botita, Calvillo. **H.** *Quercus mexicana* from Barranca Juan Caporal, San José de Gracia.

laeta has diverse leaf polymorphism even in the same tree, which makes identification challenging. This species, as well as *Q. potosina* and *Q. eduardi* are the most widely distributed oaks in Aguascalientes.

Quercus laurina Bonpl. Figure 5F.

Quercus laurina BONPLAND (1809): 32. — McVAUGH (1974): 53; GONZÁLEZ (1986): 125.

Q. barbinervis BENTHAM (1840): 56. — GONZÁLEZ (1986): 125.

Q. caeruleocarpa TRELEASE (1924): 163. — GONZÁLEZ (1986): 125.

Q. lanceolata BONPLAND (1809): 34. — GONZÁLEZ (1986): 125.

Q. ocoteaefolia LIEBMANN (1854): 176. — GONZÁLEZ (1986): 125.

Material examined: Table 1.

Tree of 10 m high. Branchlets glabrescent. Leaf of 4.5–8 × 2–3 cm, elliptic or elliptic-oblongate, margin slightly revolute, serrate, with 2–4 awned on each side, apex acute ending in awn, upper surface lustrous and glabrous, lower surface glabrescent with trichomes on midvein, base rounded. Fruit biannual, cupule hemispherical, nut short-ovoid 15–17 × 10–12 mm.

In México, the species is distributed in the states of Aguascalientes, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Oaxaca and Puebla. In Aguascalientes, it has been found in the municipalities of San José de Gracia in oak-pine forest from 2839 m.

Quercus magnoliifolia Née. Figure 5G.

Quercus magnoliifolia NÉE (1801): 268. — McVAUGH (1974): 55; GONZÁLEZ (1986): 130.

Q. circinata NÉE (1801): 272. — GONZÁLEZ (1986): 130.

Q. nudinervis LIEBMANN (1854): 182. — GONZÁLEZ (1986): 130.

Q. macrophylla NÉE (1801): 274. — GONZÁLEZ (1986): 130.

Q. haematophlebia TRELEASE (1924): 66. — GONZÁLEZ (1986): 130.

Q. lutea NÉE (1801): 269. — GONZÁLEZ (1986): 130.

Q. platyphylla WARBURG (1939): 85. — GONZÁLEZ (1986): 130.

Q. tepicana TRELEASE (1924): 255. — GONZÁLEZ (1986): 130.

Material examined: Table 1.

Tree of 5–8 m high. Leaf subcoriaceous (6–)10–16(18) × (5.5)7–12 cm, obovate, sometimes oblong-elliptic, with 9–15 mucronate teeth at the leaf margin, lobed and revolute, apex obtuse, ending in mucrone, upper surface lustrous, almost glabrous, lower surface tomentose, base oblique or cuneate. Fruit annual, cupule hemispherical and big, nut ovoid.

In México, the species is distributed in the states of Aguascalientes, Colima, Guerrero, Hidalgo, Jalisco, México, Michoacán, Nayarit, Oaxaca, Puebla, San Luis Potosí and Sinaloa. In Aguascalientes, it has been found in the municipality of Calvillo in oak forest with subtropical shrub elements from 1670–2541 m. *Quercus magnoliifolia* can be confused with *Q. resinosa* since they grow sympatrically and show leaf similarities. However, they can be differentiated by the longer and glabrescent petioles and twigs in *Q. magnoliifolia*, contrasting with the persistent tomentum in *Q. resinosa*.

Quercus mexicana Bonpl. Figure 5H.

Quercus mexicana BONPLAND (1809): 35. — ROMERO et al. (2014): 92.

Q. pabillensis MULLER (1942): 477. — ROMERO et al. (2014): 92.

Q. rugulosa MARTENS & GALEOTTI (1843): 209. — ROMERO et al. (2014): 92.

Material examined: Table 1.

Tree of 10 m high. Leaf subcoriaceous, elliptic of (1.5)3–5 × (0.7)1–1.7 cm, with entire margin, apex obtuse or acute, ending in awn, upper surface lustrous and glabrescent with imprinted veins, lower surface pubescent that can be removed easily by rubbing, base subcordata. Fruit biannual, cupule hemispherical, nut ovoid.

In México, the species is distributed in the states of Aguascalientes, Coahuila, Distrito Federal, Hidalgo, México, Nuevo León, Puebla, Querétaro, San Luis Potosí, Tamaulipas, Tlaxcala and Veracruz. In Aguascalientes, it has been found only in the municipality of Rincón de Romos in oak forest from 2112 m. In the field, can be identified by leaves with entire margins and the pubescence of the lower leaf surface that can be easily removed by rubbing. May be confused with *Q. eduardi*, which has a similar aspect.

Quercus obtusata Bonpl. Figure 6A.

Quercus obtusata BONPLAND (1809): 76. — McVAUGH (1974): 60; GONZÁLEZ (1986): 145; ROMERO et al. (2014): 100.

Q. atriglans WARBURG (1939): 88. — ROMERO et al. (2014): 100.

Q. crenatifolia TRELEASE (1924): 57. — GONZÁLEZ (1986): 145.

Q. panduriformis TRELEASE (1924): 62. — GONZÁLEZ (1986): 145.

Q. innuncupata TRELEASE (1924): 77. — GONZÁLEZ (1986): 145.

Material examined: Table 1.

Tree of 8–18 m high. Leaf coriaceous, obovate to elliptic of (5–)9–20(24) × (3)6–12(17) cm, with 6–8 mucronate teeth at the leaf margin slightly revolute, undulate, apex obtuse or rounded, ending in mucro, upper surface lustrous and glabrescent with few red and glandular trichomes, lower surface with many red and glandular trichomes, base cordata or rounded. Fruit annual, cupule hemispherical, nut ovoid (12–)17–20 × (10–)15–18 mm.

In México, the species is distributed in the states of Aguascalientes, Durango, Guerrero, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí, Veracruz and Zacatecas. In Aguascalientes, it has been found in the municipalities of Calvillo and San José de Gracia in oak forest and oak forest associated with manzanita from 2256–2700 m.

Quercus potosina Trel. Figure 6B.

Quercus potosina TRELEASE (1924): 84. — McVAUGH (1974): 58; GONZÁLEZ (1986): 160.

Material examined: Table 1.

Tree of 2–7 m high. Leaf coriaceous, obovate, oblong or oblanceolate of (2–)4–8(–12) × (1.5)2–5(–9) cm, with 4–6 mucronate teeth at the leaf margin sometimes revolute, apex rounded or obtuse, ending in mucro, upper surface lustrous and lower surface glabrescent with many red and glandular trichomes, base cordata. Fruit annual, cupule hemispherical, nut ovoid 12–20 × 10–15 mm.

In México, the species is distributed in the states of Aguascalientes Chihuahua, Durango, Guanajuato, Jalisco

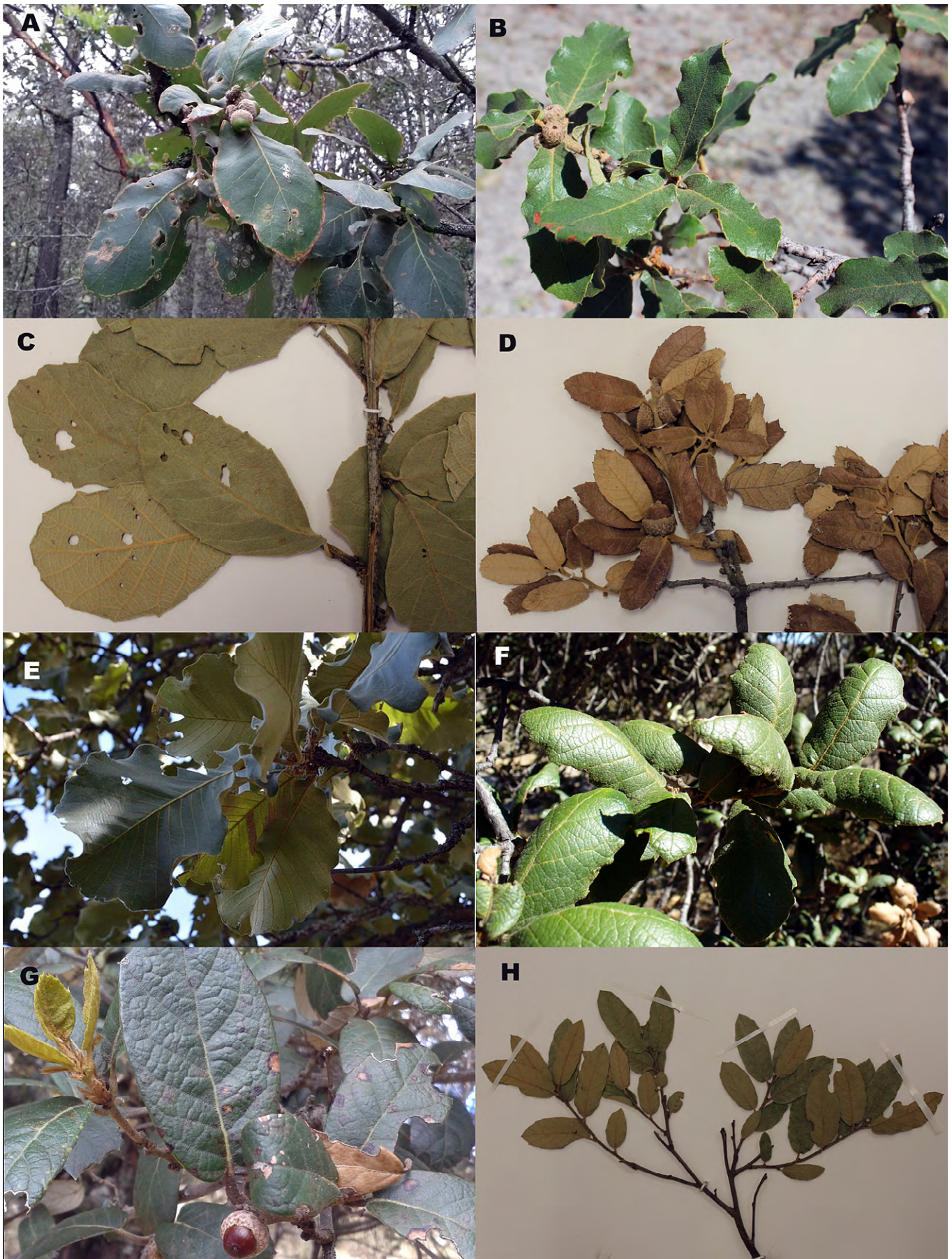


Figure 6. **A.** *Quercus obtusata* from Barranca Oscura, Calvillo. **B.** *Quercus potosina* from Agua Zarca, San José de Gracia. **C.** *Quercus praeco* from Los Alamitos, Calvillo. **D.** *Quercus repanda* from El Zepo, Sierra Fría, San José de Gracia. **E.** *Quercus resinosa* from Barranca La Botita, Calvillo. **F.** *Quercus rugosa* from Agua Zarca, San José de Gracia. **G.** *Quercus sideroxylla* from Sierra Fría, San José de Gracia. **H.** *Quercus striatula* from Los Alamitos, San José de Gracia.

and Zacatecas. In Aguascalientes, it has been found in the municipalities of Aguascalientes, Asientos, Calvillo, Cosío, El Llano, Jesús María, San José de Gracia and Tepezalá in oak, pine-oak, juniper forests, temperate and subtropical shrubs from 1890–2900 m. This is the most widely distributed species in Aguascalientes and usually is associated with *Q. laeta* and *Q. eduardi*. It can be identified by the large number of red glandular trichomes in young leaves. *Q. potosina* often grows in ramets.

Quercus praeco Trel. Figure 5C.

Quercus praeco TRELEASE (1924): 88 — McVAUGH (1974): 70; GONZÁLEZ (1986): 164.

Material examined: Table 1.

Tree of 4–5 m high. Branchlets pubescent. Leaf obovate or oblong-obovate of (2.5)4–9 × (1.5)2–5.5 cm, with 3–5 mucronate teeth at the leaf margin, revolute, apex obtuse or rounded, ending in mucrone, upper surface dark green, pubescent with imprinted veins, lower surface tomentose and whitish, base cordate or rounded. Fruit annual, cupule bell-shaped, nut ovoid 17–20 × 10–15 mm.

In México, the species is distributed in the states of Aguascalientes, Jalisco, Nayarit, San Luis Potosí and Zacatecas. In Aguascalientes, it has been found in the municipalities of Calvillo and Rincón de Romos in oak forest and temperate shrub from 2018–2360 m.

Quercus repanda Bonpl. Figure 6D.

Quercus repanda BONPLAND (1809): 31. — ROMERO et al. (2014): 128. *Q. subtriloba* TRELEASE (1924): 81. — ROMERO et al. (2014): 128.

Material examined: Table 1.

Shrub of 0.30–1.60 m high. Branchlets tomentose or glabrescent. Leaf of (1.5)2.5–5 × (0.7)1–2.5(3.5) coriaceous, ovate, obovate or oblong-elliptic, with entire margin sometimes with 1–4 short-mucrone at the leaf margin, apex obtuse or rounded, ending in mucrone, upper surface lustrous glabrescent with imprinted-veins, lower surface tomentose and yellowish, base cordate or rounded. Fruit annual, cupule hemispherical with margin entire, nut ovoid 10–14.5 × 9–11 mm.

In México, the species is distributed in the states of Aguascalientes, Hidalgo, Puebla, San Luis Potosí and Tlaxcala. In Aguascalientes, it has been found in the municipalities of Calvillo and San José de Gracia, in oak, pine-oak forest, oak manzanita shrub and grasslands from 2250–2750 m. In the field, it can be identified by its shrubby rizomatous habit, leaves with yellow lower surface due to yellow dense indumentum, and 2–4 mucronate teeth at the leaf margin.

Quercus resinosa Liebm. Figure 6E.

Quercus resinosa LIEBMANN (1854): 182. — McVAUGH (1974): 73; GONZÁLEZ (1986): 172.

Material examined: Table 1.

Tree of 6–10 m high. Leaf subcoriaceous of (10)13–28(30) × (5–)8–18(20) cm, obovate, sometimes oblong-elliptic,

with 8–18 mucronate teeth at the leaf margin, lobed and revolute, petioles tomentose, apex obtuse, rounded or acuminate, ending in mucrone, upper surface sometimes lustrous, glabrous, lower surface tomentose, base subcordate. Fruit annual, cupule hemispherical and big, nut ovoid 15–32 × 15–20 mm.

In México, the species is distributed in the states of Aguascalientes, Durango, Guanajuato, Jalisco, Michoacán, San Luis Potosí and Zacatecas. In Aguascalientes, it has been found in the municipalities of Aguascalientes, Calvillo, El Llano, Jesús María and San José de Gracia.

This species inhabits drier areas and lower elevations compared to the other oak species, and is found in lowlands oak forests, shrublands and grasslands from 1670–2600 m. It usually forms homogeneous populations associated to *Q. eduardi* and sometimes *Q. magnoliifolia* with which it can be confused.

Quercus rugosa Née. Figure 6F.

Quercus rugosa NÉE (1801): 275. — McVAUGH (1974): 75; GONZÁLEZ (1986): 178; ROMERO et al. (2014): 135.

Q. conglomerata TRELEASE (1924): 77. — GONZÁLEZ (1986): 178.

Q. reticulata BONPLAND (1809): 40. — ROMERO et al. (2014): 135.

Q. decipiens MARTENS & GALBOTTI (1843): 214. — ROMERO et al. (2014): 135.

Q. purpusii TRELEASE (1924): 76. — GONZÁLEZ (1986): 178.

Material examined: Table 1.

Tree of 7–13 m high. Leaf concave, very coarse, thick and rigid, obovate, elliptic-obovate of (3)5–12(–18) × (2)3–8(10) cm, with 5–8 mucronate teeth at the leaf margin, apex rounded or obtuse, ending in mucrone, upper surface sometimes lustrous and glabrescent, lower surface with red or yellow glandular trichomes, base cordata or rounded. Fruit annual, cupule hemispherical, nut ovoid-narrow of 10–25 × 8–13 mm.

Distributed from western Texas, southern Arizona to México. In México, found in the states of Aguascalientes, Coahuila, Chihuahua, Durango, Distrito Federal, Guanajuato, Hidalgo, Jalisco, Michoacán, México, Puebla, Veracruz and Zacatecas. In Aguascalientes, it occurs in the municipalities of Calvillo, San José de Gracia and Rincón de Romos. It inhabits oak, pine-oak, oak-juniper forests, mainly on humid ravine slopes, and in subtropical oak forests from 2019–2900 m. In the field, it can be distinguished by leaves that are concave, very coarse, thick and rigid.

Quercus sideroxyla Bonpl. Figure 6G.

Quercus sideroxyla BONPLAND (1809): 39. — McVAUGH (1974): 82; GONZÁLEZ (1986): 194.

Q. incarnata TRELEASE (1924): 126. — McVAUGH (1974): 82.

Material examined: Table 1.

Tree of 8–15 m high. Leaf oblanceolate, oblong-elliptic or obovate thick and rigid of (2.5)4–8(13) × (1.5)2.5–4(7.5) cm, with 1–5 awns teeth at the leaf margin revolute, rarely entire, apex obtuse or subacute, ending in awn, upper surface lustrous and glabrous with imprinted-veins, lower surface whitish or yellowish, tomentose, base cordate or

rounded. Fruit biannual, cupule hemispherical, nut ovoid 10–15 × 10 mm.

In México, the species is distributed in the states of Aguascalientes, Chihuahua, Coahuila, Durango, Guanajuato, Jalisco, Nayarit, Nuevo León, San Luis Potosí, Sonora, Tamaulipas and Zacatecas. In Aguascalientes, it has been found in the municipalities of Calvillo, Jesús María and San José de Gracia in oak, pine-oak, oak-juniper forest on humid slopes from 2300–2867 m.

Quercus striatula Trel. Figure 6H.

Quercus striatula TRELEASE (1924): 93. — VALENCIA (2004): 52.

Material examined: Table 1.

Shrub of 60 cm high. Branchlets pubescent. Leaf of (1.5–)3–4.5 × 1–1.5(–2) cm, subcoriaceous, elliptic or oblong, margin entire and slightly revolute, sometimes with 1–2 short-mucrone at the leaf margin, apex obtuse or acute, ending in mucrone, upper surface some lustrous, glabrescent with imprinted-veins, lower surface paler and tomentose, base cordate or rounded. Fruit annual, cupule hemispherical with margin entire, nut ovoid-elliptic of 8–15(–16.5) × 7.5–11(–13) mm.

In México, the species is distributed in the states of Aguascalientes, Chihuahua, Durango and Zacatecas. In Aguascalientes, it has been found in the municipalities of San José de Gracia and Jesús María in oak, oak-pine forests from 2150–2574 m.

Quercus viminea Trel. Figure 7.

Quercus viminea TRELEASE (1924): 123. — McVAUGH (1974): 91; GONZÁLEZ (1986): 213.

Q. bolanyosensis TRELEASE (1924): 223. — GONZÁLEZ (1986): 213.

Material examined: Table 1.

Tree of 10–15 m high. Leaf lanceolate or linear lanceolate of (4)8–13(–17.5) × (0.7)1–3(5.5) cm, yellowish green, coriaceous, with margin strongly thickened but not revolute, entire or with 1–3 aristate teeth, apex attenuate or narrowly acute, base cordate or subcordate; upper surface lustrous, glabrous or with some small trichomas, lower



Figure 7. *Quercus viminea* from Arroyo Ojocalientillo, Calvillo.

surface paler and yellower, glabrescent with trichomas in the axils of the large veins. Fruit biannual, cupule hemispheric, nut elongated-ovoid 11 × 7 mm.

In México, this species occurs in the states of Aguascalientes, Chihuahua, Durango, Guanajuato, Jalisco, Nayarit, San Luis Potosí, Sinaloa, and Sonora. In Aguascalientes, it is only found in the municipality of Calvillo in oak, pine-oak forests in Sierra del Laurel, from 2350–2460 m.

DISCUSSION

As shown here, the white oaks are more diverse than the red oaks in Aguascalientes. According to ZAVALA (1998), the western part of México has a higher concentration of white oak species than red oaks. Nationally, there are 81 species in *Quercus* sect. *Quercus* (white oaks) and 76 species in *Quercus* sect. *Lobatae* (red oak) (VALENCIA 2004). NIXON (1993b) briefly mentions a scarcity of red oaks in relatively dry areas, such as Aguascalientes, as opposed to the white oaks, which often are dominant. The municipalities with the greatest number of white oak species are at higher elevations in the western part of the state. The white oaks are found in dryer areas than the red oaks (from 1800–2900 m), with the exception of *Q. rugosa*, which is located on humid north-facing slopes or in areas that transition between temperate and subtropical forest. The most abundant oak species in Aguascalientes are *Q. potosina* and *Q. laeta*, which are white oaks, and usually associated to *Q. eduardi* or *Juniperus deppeana*. All the shrubby oaks in the state are in *Quercus* sect. *Quercus*, such as *Q. depressipes*, *Q. greggii*, *Q. repanda*, and *Q. striatula*, and found in oak, oak-pine forests from 1900–2750. On the other hand, the red oaks are distributed in more humid areas and usually at higher elevations (from 2000–2800 m) with the exception of *Q. aristata* and *Q. eduardi* that grow at lower elevations (from 1530 m). *Quercus eduardi* is the most abundant red oak, in contrast to *Q. durifolia* and *Q. laurina*, which are the scarcest. *Quercus durifolia* is found at the base of hillsides and is associated with *Q. rugosa* and *Q. grisea*. *Quercus candicans*, *Q. castanea*, *Q. gentryi* and *Q. viminea* are distributed in subtropical habitats in the municipality of Calvillo. *Quercus jonesii* is located in isolated patches on rocky slopes and limestone. It is generally associated with *Pinus lumholtzii* (DE LA CERDA 1999b) and *Q. sideroxylla* and is located in the highest parts of Sierra Fría, where it grows in shaded ravines. It is usually associated with pine species.

An extensive field exploration in all municipalities of Aguascalientes, plus the availability of expanded literature and herbarium type specimens, led to the report of 10 oak species that had not been found previously in the state. *Quercus crassifolia* and *Q. microphylla* were reported before (DE LA CERDA 1999b), but samples identified as *Q. crassifolia* turned out to be *Q. potosina*. Specimens identified as *Q. microphylla* were misidentified; some were determined to be *Q. repanda* and others *Q. striatula*. Errors in identification are common in oaks since several species resemble each other and can easily be confused. The

oaks are regarded as a challenging group because of their complicated taxonomy and their morphological variability (even within the same individual tree!). It has been noted that several closely related species have the ability to hybridize (GONZÁLEZ 1993; VALENCIA 2004; ZAVALA 1998). Another difficulty is the inaccessibility of, or lack of details provided by, the type material and protologue (VALENCIA 2004); thus, some species are poorly known (ZAVALA 1998).

Furthermore, several species that are found in Aguascalientes can be easily confused in the field. *Quercus chihuahuensis* and *Q. deserticola* are morphologically similar, however, imprinted veins on the adaxial surface of *Q. deserticola* can differentiate both species. Another example includes *Q. eduardi* and *Q. mexicana*. Both are large trees with bright green foliage with leaves that are pubescent on the underside (the pubescence can be easily removed by rubbing). However, *Q. mexicana* has imprinted veins on the adaxial leaf surface. *Quercus resinosa* and *Q. magnoliifolia*, are similarly alike, but they can be differentiated because *Q. resinosa* has petioles and tomentose twigs, while *Q. magnoliifolia* has glabrous twigs and petioles and bulleted epidermis. DE LA CERDA (1999) pointed out that *Q. laeta* and *Q. potosina* are difficult species to identify due to their great morphological variability. These species also can be found in the form of shrubs in higher elevations. They have a wide distribution and are found in many vegetation types transitioning from oak forest to subtropical climates at elevations from 1900–2700 m (2900 m for *Q. potosina*).

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