
Agave valenciana (Agavaceae), a Gigantic New Species from Jalisco, Mexico

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ABSTRACT. *Agave valenciana* (Agavaceae), a new species from Jalisco, western Mexico, is described and illustrated. This species is endemic to a small section of the canyons of the Mascota and Talpa rivers. It belongs to the *Agave* subgenus *Agave* L. and to the *Marmoratae* species group. It appears to be closely related to *A. marmorata* Roezl from Puebla and Oaxaca. It differs from the latter in having a much larger rosette diameter, it has fewer but longer and wider leaves, much larger flowers, and it grows in less arid environments. This discovery has implications for “raicilla” production, an alcoholic tequila-like beverage traditionally manufactured in western Jalisco, Mexico.

RESUMEN. Se describe y se ilustra *Agave valenciana* (Agavaceae), una especie nueva de Jalisco, en el occidente de México. Esta especie es endémica de una porción de las cuencas de los ríos Mascota y Talpa. Pertenece al subgénero *Agave* L. y al grupo *Marmoratae*. Su pariente más cercano parece ser *A. marmorata* Roezl de Puebla y Oaxaca. Difiere de esta última en tener un mayor diámetro de roseta, menos hojas pero más largas y anchas, flores más grandes y crece en ambientes menos áridos. Este descubrimiento tiene implicaciones en la producción de “raicilla”, una bebida similar al tequila que se produce tradicionalmente en el oeste de Jalisco, México.

Key words: *Agave*, century plant, maguey, *Marmoratae*, mescal, Mexico, mezcal, raicilla.

An alcoholic tequila-like beverage, a type of mescal, called “raicilla” or “ximat” is traditionally

prepared from *A. maximiliana* Baker (“lechuguilla”) in rural highlands of western Mexico (Vázquez-García et al., 1995, 2004; Valenzuela Zapata, 2003). However, the “raicilla” is occasionally manufactured from, or mixed with, a different century plant called “maguey relisero” (Rafael Castellón & Oscar Valencia, pers. comm.). After examining wild populations of “maguey relisero” at Mascota, Jalisco, we could not place it in any currently recognized species. Thus, it is herein described as new.

Agave valenciana Cházaro & A. Vázquez, sp. nov.
TYPE: Mexico. Jalisco: Mun. Mascota, Coamil del Naranjo, 7 km NW of Mascota, 20°35'N, 104°54'W, 1250 m, transition betw. tropical dry forest & oak forest, 25 Apr. 2004 (fl), Y. L. Vargas-Rodriguez, M. Cházaro-B. & J. A. Vázquez-García 436 (holotype, IEB; isotypes, ENCB, GUADA, IBUG, MEXU, MO, WIS, XAL). Figures 1 and 2.

Herba simplex nonsurculosa, *A. marmoratae* affinis sed statura validiore et foliis et floribus grandioribus; rosulis usque 1.7–2.2 m altis, 2.7–3.3(4.1) m diametro; foliis 7 ad 15 rosulatis, 150–230 cm longis, 37–46(53) cm latis ad medium, atro-viridibus, supra pallide zonatis, viridibus vel glaucis notatis; inflorescentia cum scapo 5–6(7) m alta, floribus 50–60(70) mm longis intense luteis; capsulis 23–29 mm longis, 10–13 mm latis; seminibus 3–4.5 mm longis, 2–3 mm latis.

Perennial plant, solitary, not suckering, 5–6(7) m tall; rosettes 1.7–2.2 m high, 2.7–3.3(4.1) m diam., short-stemmed, with 7 to 15 leaves. Mature leaves 150–230 cm long, 37–46(53) cm wide in the middle, up to 30 cm wide at the base, up to 15 cm thick at the base, broadly lanceolate, in various at-

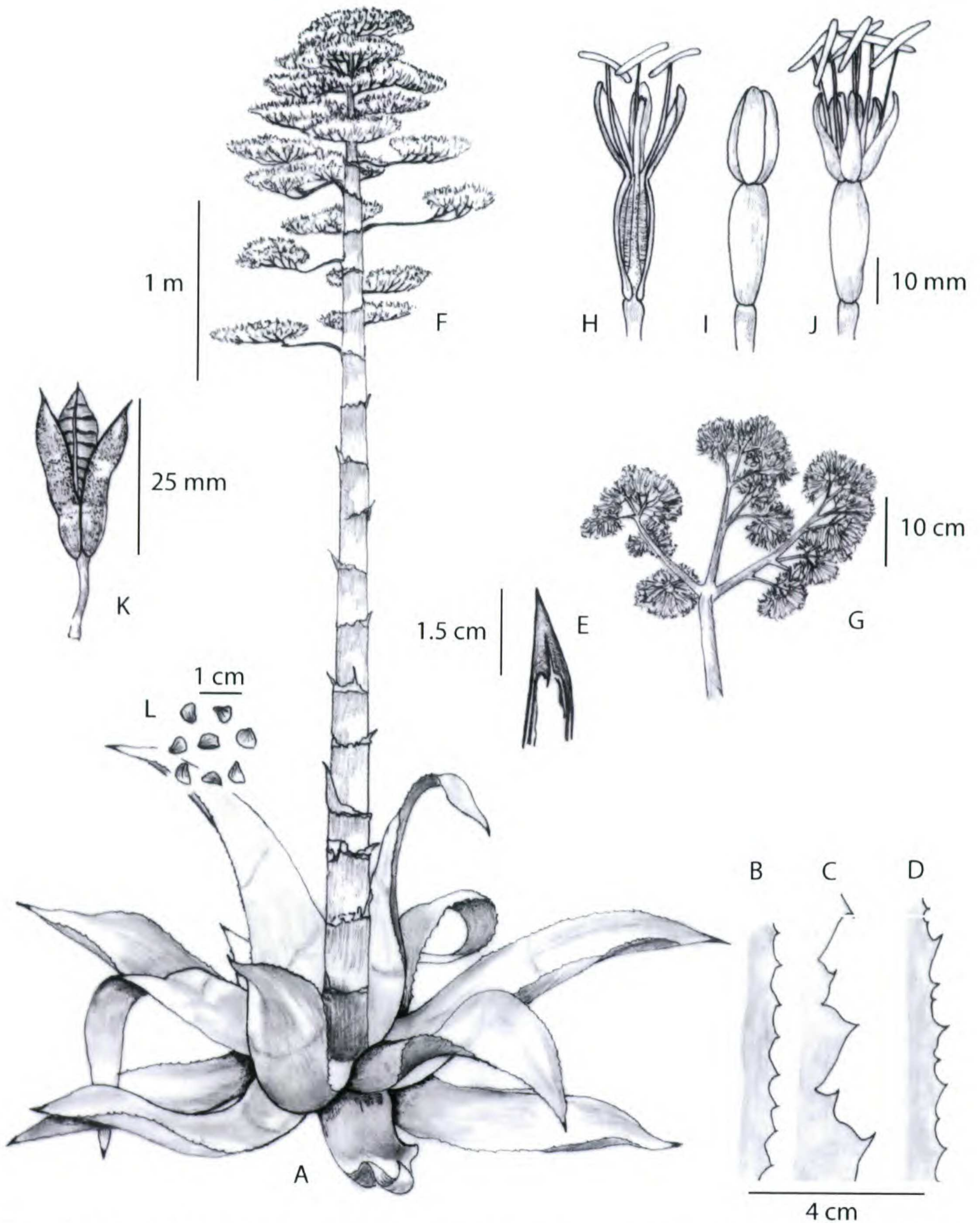


Figure 1. *Agave valenciana* Cházaro & A. Vázquez, line drawing based on *M. Cházaro et al. 8110* (IBUG). —A. Habit. —B–D. Leaf teeth at the base, middle, and top, from *Vargas-Rodríguez et al. 436* (IBUG). —E. Terminal spine, from *Vargas-Rodríguez et al. 436* (IBUG). —F. Inflorescence. —G. Flowering branch. —H. Flower in cross section. —I. Flower bud. —J. Mature flower. —K–L. Fruit and seeds, from *Vázquez-García et al. 7954* (IBUG).

titudes, thick, firm concave, dark green, slightly glaucous, smooth at lower and upper surface, cross-banded in both sides; margins frequently undulate, distinctly crenate at the middle to closely dentate

at the ends, with mammae $4-6 \times 5-19$ mm; mammilliform teeth mostly $2-5(-7)$ mm, $5-17(22)$ mm apart, flattened, the cups from very broad bases $5-9(12)$ mm, mostly straight, some curved toward the

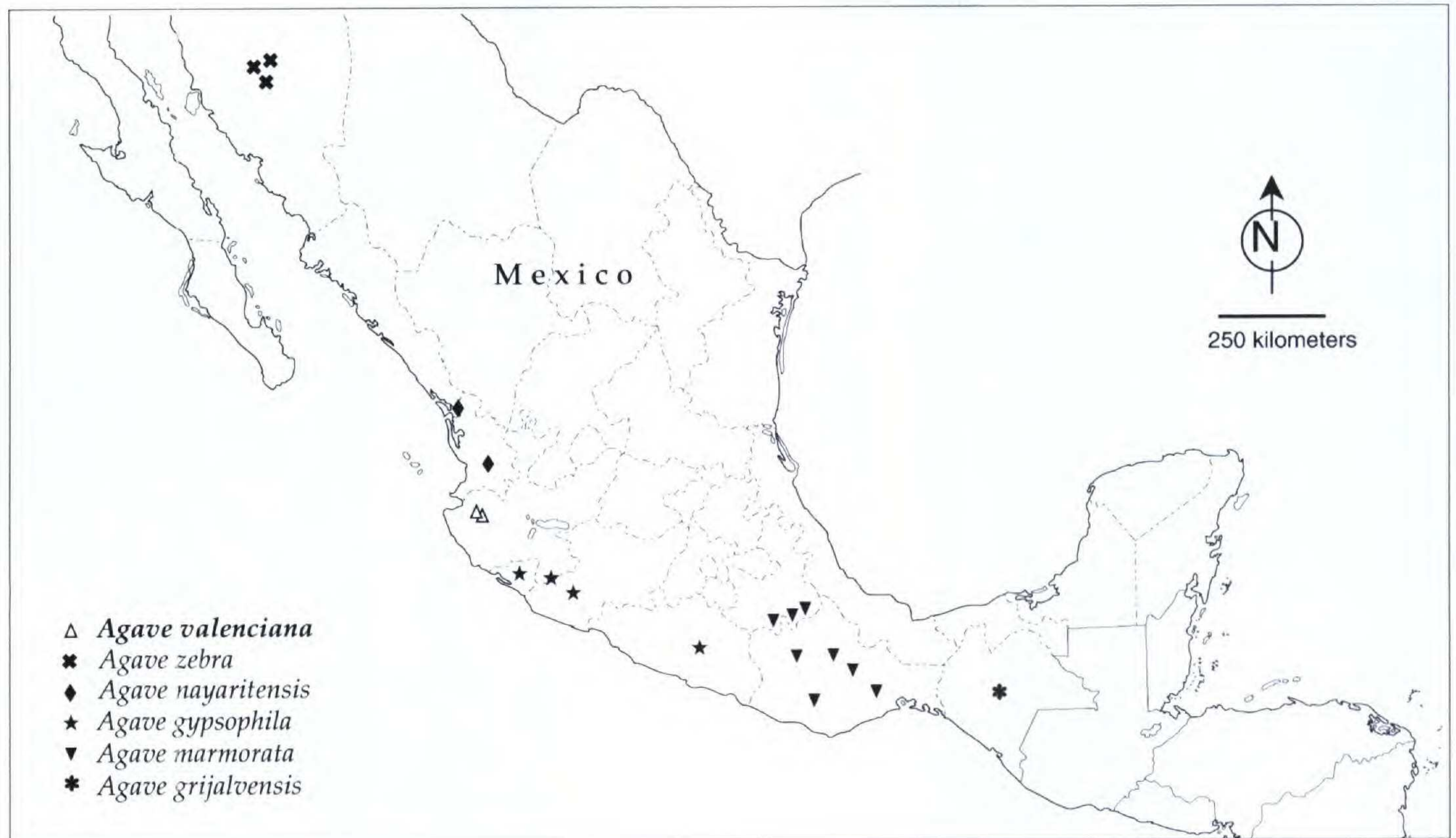


Figure 2. Distribution in Mexico of *Agave valenciana* and other species in the Marmoratae group (Gentry, 1982; Etter & Kristen, 2002).

base, dark brown to red-brown, interstitial teeth few or none; spine 10–15(20) mm long, usually short and conic, robust, rarely short-decurrent, dark brown to red-brown. Panicles 5–6(7) m high, shaft 12–35 cm diam. at the base, with 25 to 35 diffuse and flat-topped umbels in the upper half of shaft; bracts triangular, acute at the apex, variable in size along the shaft, spirally arranged, scarious, ca. 15 cm apart. Flowers 50–60(70) mm long, brilliant yellow, protandrous; ovary body 18–27 × 4–5 mm, light green, the neck 3–5 mm long and uncontracted; tube 5–7 mm long, 10 mm wide, somewhat funnel-form; tepal 10–13 × 4–5 mm, linear, fleshy, erect, the apex galeate, yellow; filaments 34–38 mm long, inserted at 2–4 mm near base of tube, slender, yellow; anthers 10–17 mm long, centric, yellow. Capsules oblongoid 23–29 × 10–13 mm, slender stipitate, short-beaked, thin walled; carpels acute, 23–29 × 7–8 mm, curving outward for dehiscence; seeds triangular, but curved in one side, 3–4.5 × 2–3 mm, flat, membranous, light, black (Fig. 1).

Habitat. *Agave valenciana* thrives on steep slopes of basaltic rock in canyons that are part of the Mascota and Talpa watersheds, at the north-western end of Sierra Madre del Sur. It is, so far, endemic to this region although the flora of much of this cordillera is not well known. *Agave valenciana* grows in the ecotone of tropical dry forest with oak forest, together with *Euphorbia tanquetuete* Sessé & Mociño, *Bursera* Jacquin ex L., *Ficus*

petiolaris HBK, *Jacaratia mexicana* DC., *Plumeria rubra* L., *Agonandra racemosa* (DC.) Standley, *Euphorbia pulcherrima* Willdenow, *Quercus* L., *Pseudobombax ellipticum* HBK, *Cephalocereus alensis* (Weber) Britton & Rose, *Pedilanthus calcaratus* Schlechtendal, *Nopalea* Salm-Dyck, *Opuntia* Miller, *Mammillaria* Torrey & Gray, *Hechtia* Klotzsch, and *Pittocaulon phylliaris* McVaugh.

Phenology. Flowering from March to May; fruits dehiscing from September to November (Apolinar Gómez-Nuñez, pers. comm., 2004).

Common names. “Maguey relisero,” “maguey marzeño,” or “maguey manso” (Oscar Valencia, pers. comm.).

Distribution. So far, *Agave valenciana* is endemic to the steep and rocky canyons of the Mascota and Talpa rivers, both in western Jalisco, at 900–1250 m asl (Fig. 2). This species was recently observed, but not collected, 15 km west of the type locality, near El Mosco canyon, in the vicinity of the Talpa river. The authors observed less than 300 adult individuals near the type locality; however, further exploration in the entire extent of those canyons is urgently needed, especially at El Mosco area.

Conservation status. *Agave valenciana* deserves a protected status. This species has an adult mean density of 15 individuals per ha (Apolinar Gómez-

Nuñez, pers. comm.), it is not a suckering plant, and it is sometimes used for “raicilla” production. Thus, we propose its inclusion to the Mexican endangered species act (NOM-059-ECOL, 2001) under the Special Protection category. This category includes possible threatened species and promotes population recovery and habitat restoration.

Different conservation and reproduction efforts for *Agave valenciana* have arisen. Few plants have been grown successfully from seeds (Oscar Valencia, pers. comm.) and specific mature individuals have been spotted for seed collection during the early autumn of 2005. Apolinar Gómez-Nuñez, an agronomist and teacher at the CEBETA high school (Dirección General de Educación Tecnológica Agropecuaria-SEP, Mascota, Jalisco), is currently collaborating with the authors implementing demographic and pollination studies, seed collections, and germination experiments for *A. valenciana* conservation and cultivation purposes.

Studied populations were located on private properties; three of the landowners, Ramón Briseño, Miguel Esparza, and Margarita Nelson, are aware of the potential of this species and the need to protect it. For now, extraction of plants from habitat should be avoided to prevent ecosystem degradation. However, planned collection of seeds should be allowed to promote its reproduction in nurseries and its eventual introduction into cultivation.

Potential use and economic value. *Agave valenciana* is a remarkable addition to the succulent flora of western Mexico and deserves to be cultivated at least as an ornamental species because of its impressive size and its showy brilliant yellow flowers. Its potential for “raicilla” production is also promising but needs to be explored and evaluated. For instance, mature “heads” of *A. valenciana* used for “raicilla” production weight far over 350 kg (Manuel Salcedo Gutiérrez, pers. comm., 2004), at least three times heavier than those of *A. tequilana* Weber. *Agave valenciana* is known for having acceptable sugar content (Apolinar Gómez-Nuñez, pers. comm., 2004), and it is believed that the plants reach maturity in 15 years. To the best of our knowledge, the density of *A. valenciana* in the studied area is nearly 50 individuals per ha, with an adult density of 30%. Considering the extent of the two canyons (20 km to their convergence) and their relatively homogeneous habitat, we speculate that several thousands of adult individuals could exist in the area.

The social organization and infrastructure for promoting *Agave valenciana* as a new source of

“raicilla” in western Jalisco already exist, since recently a Mexican board (Consejo Mexicano de Promoción de la Raicilla) for promotion of “raicilla” from *A. maximiliana* was established. This board is now headed by Manuel Salcedo-Gutiérrez and includes 37 board members, 22 distilleries, with over 50,000 plants and an annual “raicilla” production of 5,000 liters.

Eponymy. We are pleased to name this impressive century plant after Oscar M. Valencia-Pelayo, a talented amateur botanist who in the last five years has been engaged in the study and reproduction of trees and agaves of western Mexico.

Discussion. *Agave valenciana* belongs to the *Agave* subg. *Agave* L. and to the Marmoratae species group as assigned by H. S. Gentry (1982). Except for its much larger habit and leaves, this species shares most of the distinctive characteristics of the Marmoratae species group (Gentry, 1982), such as crenate margins, small terminal spines, small bright yellow flowers with small tubes 1/4 to 1/2 as long as the tepals and cross-banded leaves in both sides.

Agave valenciana is perhaps most related to *A. marmorata*, from Puebla and Oaxaca in Mexico, for having a robust habit, leaves much wider at the middle than at the ends, cross-banded in both sides, and marginal teeth spaced over 15 mm apart. The new species differs from the latter in having a much larger rosette diameter (cf. Table 1 for contrasting states in *A. marmorata*), fewer but longer and wider leaves, smaller spines, teeth, and capsules, and growing in less arid environments of western Jalisco in the transition between tropical dry forest and oak forest (Table 1). We also contrasted *A. gypsophila* H. S. Gentry and *A. nayaritensis* H. S. Gentry against *A. valenciana* (Table 1), since they occur in western Mexico and are members of the Marmoratae species group, sensu Gentry (1982). However the two are far smaller in habit, they are not distinctly wider at the middle of the leaves than at the ends, neither are the leaves cross-banded. Furthermore, they differ in geography and habitat (Gentry, 1982; McVaugh, 1989; Etter & Kristen, 2002).

The Marmoratae species group sensu Gentry (1982), with the addition of *Agave valenciana*, now includes six species and displays notable patterns of allopatric speciation, habitat specialization, and narrow endemism (Fig. 2). In Mexico, *Agave zebra* H. S. Gentry is only known from arid mountains in the Sonoran Desert (Gentry, 1982); *A. nayaritensis* H. S. Gentry is only known from moist tropical cliffs at Nayarit and Sinaloa (Etter & Kristen,

Table 1. Comparison of *Agave valenciana* Cházaro & A. Vázquez with morphologically and geographically related species of the Marmoratae species group (Gentry, 1982; Etter & Kristen, 2002).

Characters	<i>A. nayaritensis</i>	<i>A. gypsophila</i>	<i>A. marmorata</i>	<i>A. valenciana</i> sp. nov.
Rosette height & diam.	[0.8–1.1 × 1.5–2 m]*	[0.5–1 × 1–2 m]***	1.2–1.3 × 2 m	1.7–2.2 × 2.7–3.3(4.1) m
No. of leaves	[9–18(–40)]**	20–30	30–50	7–15
Leaf length & max. width	85–115 × 12–15 cm	45–100(110) × 7–12 cm	100–135 × 20–30 cm	150–230 × 37–46(53) cm
Leaf margin	Straight to undulate	Crenate with mammilliform teeth	Crenate, mammilliform teeth	Crenate, mammilliform teeth
Leaf strength & texture	Floppy/Asperulous	Fragile/scabrous****	Thick/roughly scabrous	Thick, firm/smooth
Leaf color	Light green	Glaucous gray [(-green)]****	Glaucous gray to light green	Dark green to slightly glaucous
Terminal spine	9–15[(-20)]** mm	5–15 mm	15–30 mm	10–15 (20) mm
Teeth size	1–3[(-4)]** mm	1–2 mm	6–12 mm	2–5(–7) mm
Marginal foliar teeth	10–15[(-20)]** mm apart	[5–10(20) mm apart]****	20–50 mm apart	5–17(22) mm apart
Inflorescence height	[(1–)]** 3–4 m	2–3 m	5–6.5 m	5–6(7) m
Flower length	40–45 mm•	30–35 mm**	40–48 mm***	50–60(70) mm• 34–35(40) mm**
Ovary	20–25 mm	18–20 mm	20–25 mm	18–27 mm• 20 mm**
Tube	4 mm	4–5 mm	5–6 mm	5–7 mm• 4 mm**
Tepals	15–17 × 3–4 mm	10–11 × 3–4 mm	14–16 × 4 mm	10–13 × 4–5 mm• 10.5 × 3–4 mm**
Filament insertion	3–4 mm	1–2 mm	4.5–5 mm	2–4 mm• 2–3 mm**
Filaments	35–37 mm	20–25 mm	34–37 mm	34–38 mm• 27–33 mm**
Capsules	[16–25(28) × 10–14 mm]**	Unknown	40 × 16–18 mm	23–29 × 10–13 mm
Seeds	[5 × 3.5 × 1 mm]**	Unknown	Unknown	3–4.5 × 2–3 mm
Habitat	Volcanic cliffs	Gypsum soils and limestone	Limestone rocks	Volcanic basaltic cliffs
Vegetation cover	Mixed tropical forest	Thorn forest [deciduous forest]****	Oak woodland & short tree forest, [semi-arid scrub]***	Transition between tropical dry forest & oak forest
Distribution in Mexico	Nay.	Jal., Col., [Mich.]*** & Gro.	Pue., Oax.	Jal.
Elevation	[585–640]*(–670) m	360–914[(-1400)]*** m	1350–1830 m	900–1250 m

Most data obtained from Gentry (1982), otherwise indicated: * Mexico, Nayarit, Tepic, Mirador del Águila, Cházaro B. et al. 8112 (IEB) and 8121 (IBUG). ** México: Nayarit, Escuinapa and Salto de Jumatán (Etter & Kristen, 2002). *** México: Michoacán, Coalcomán, Tehuantepec, M. Cházaro et al. 8170 (IEB). **** After McVaugh (1989). • Measurements from fresh or pickled flowers. ** Measurements from dried flowers relaxed by boiling. *** Determined from a picture, page 185; fig. 16 (García-Mendoza, 2002).

2002); *A. valenciana* Cházaro & Vázquez is only known from transitional tropical dry forest with oak forest on basaltic slopes at western Jalisco; *A. gypsophila* H. S. Gentry is known from limestone at the seaward facing slopes of Sierra Madre del Sur in Colima, Jalisco (but not from Manantlán as cited by Vázquez-García et al., 1995), Michoacán, and Guerrero (Gentry, 1982; McVaugh, 1989); *A. marmorata* Roezler is found in semiarid xerophytic scrub in Puebla and Oaxaca (Gentry, 1982); and *A. grijalvensis* B. Ullrich is endemic to the tropical dry forest at Cañón del Sumidero, Depresión Central de Chiapas (Ulrich, 1990).

Paratypes. MEXICO. **Jalisco:** Mun. Mascota, Coamil del Naranjo, 7 km NW of Mascota, 12 Apr. 2001, M. Cházaro-B., O. Valencia-P. & I. Contreras-V. 8110 (IBUG); 25 Apr. 2004, Y. L. Vargas-Rodríguez, M. Cházaro-B. & J. A. Vázquez-García 438 (IBUG); 25 Apr. 2004, J. A. Vázquez-García, Y. L. Vargas-Rodríguez & M. Cházaro-B. 7829b (IBUG); 18 Dic. 2004, J. A. Vázquez-García, Y. L. Vargas-Rodríguez & Apolinar Gómez 7954 (IBUG).

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