

FIG. 2. *Manfreda petskinil* R. Orellana, L. Hernández & Carnevali. A. Flower during gynandrous phase, longitudinal section: note filament insertion point; arrow points stigma. B. Portion of inflorescence with several flowers showing different phenophases. C. Flowering plant: note paniculated inflorescence. D. Mature rosette; arrow points to new growth emerging from the axils of the central leaves of flowering rosette; cultivated plant E. Immature plants under deep shade in habitat.

“hunpets’kinil” (el que se mancha o estampa con el sol” or “he or she who becomes spotted with the sun”) and Xpets’kinil (“la que pesca el sol”) fide Sr. Francisco Góngora interviewed by R. Orellana (Sept 30, 1982 at the village of Mama, Yucatán). Souza Novelo (1940) recorded the common names “xix-ki” (“garbage agave”) and “hunpets’k’in’ki” (an

alternative spelling of “hunpets’kinil”, the genus namesake in the Yucatán Peninsula).

***Manfreda petskinil* R. Orellana, L. Hernández & Carnevali, sp. nov.** TYPE: MÉXICO: YUCATÁN: Municipio Izamal, Cenote Xcholac (Xcolak, sic!) 14–15 km. al E de Izamal por la vía a Tunkás, aprox.  $20^{\circ} 54' 50''$  N,  $88^{\circ} 50' 00''$  W, 20–50 m.s.m. 28 enero 2007, G. Carnevali and I. M. Ramírez 7206 (Holotype CICY; Isotypes MO, QMEX). Fig. 4.

Species haec *Manfreda paniculata* L. Hernández, R. Orellana & Carnevali sed plant et flos parviore, foliis longioris proportione angustiore inflorescentia multibreviore, floris sessilis differt. Verosimiliter affinis *Manfreda scabra* sed foliis perenniis, inflorescentia paniculata, stylo filiforme recedit.

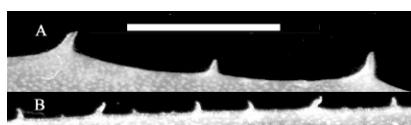


FIG. 3. Comparison of leaf-margins of the new manfredas. A. *Manfreda paniculata*. B. *Manfreda petskinil*.

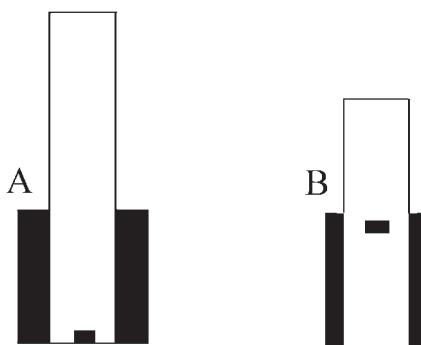


FIG. 4. Tube/tepala ideograms of new manfredas. A. *Manfreda paniculata* L. Hernández, R. Orellana & Carnevali. B. *Manfreda petskinil* R. Orellana, L. Hernández & Carnevali.

Succulent, acaulescent, perennial, rosettofili-  
lous plants, rosettes 30–50 cm tall, polycarpic.  
**Rhizome** globose 5–7 cm long, proliferating  
through the production of new rosettes from  
lateral meristems at the base of the inflores-  
cence; **roots** succulent; **leaves** 7–30, linear-  
lanceolate, recurvate, somewhat flaccid, 18–  
38 cm long, 1–2 cm width, pale to dark green  
with darker green to reddish spots, these more  
vivid on some individuals and on leaves  
exposed to bright light, succulent, slightly  
channeled (ca. 1.4 mm at the widest section  
of the leaf), surface smooth, apex long  
attenuate with a short soft tip, margins  
achlorophyllous, hyalinous, denticulate with  
small, irregular teeth, 0.25–0.5 mm long.  
**Inflorescence** 1.3–1.6 m tall, a raceme or more  
often a panicle in well-developed plants with  
2–5 branches; scape 1.1–1.35 m, with 3–6  
internodes, green or reddish, often with darker  
blotches as in the leaves, subtended by linear  
to long triangular, papiraceous bracts 1–3 cm  
long, which are eventually deciduous, also  
presenting darker spots; floral parts 20–35 cm  
long, branches 15–23 cm long, suberect, at a  
20–30° angle from the peduncle and rachis,  
densely flowered (up to 1.5 flowers per cm of  
branch length and up to 25 flowers on the  
longest uppermost branch), sterile portion of  
the branches 7–18 cm long, terete, with 2–4  
internodes subtended by 0.8–1.2 cm long  
bracts similar in shape but smaller to those  
of the peduncle; floral bracts papyraceous,  
deltoid, 4–10 × ca. 3 mm, borne besides the  
solitary bracteole, bracteole 3–4 mm long,  
triangular, membranous, pedicels 1.0–1.5(2)  
mm long. **Flowers** protandrous, solitary, 3.0–  
3.5 cm long from base of ovary to apex of

tepals, light green outside, glaucous, dull  
yellowish-green inside or with reddish tinges;  
perianth tube 5–7 mm long, broadly funnel-  
form; perianth lobes 12–15 × 2–4 mm, re-  
flexed during the staminate phase of the  
flower, erect with age of the flower, during  
the pistillate phase of the flower, apex  
cucullate with a small terminal tuft of glandular-  
ular, white trichomes; stamens diverging up to  
> 45° from the style in anthesis, inserted at the  
apex of the perianth tube, filaments filiform,  
4–7 cm long, dark shiny reddish-brown; an-  
thers dorsifixed 10–15 mm long, versatile,  
erect to slightly curved upon maturity, caducous.  
Ovary cylindrical 12–18 mm long, col-  
ored as the outer faces of the tepals, smooth  
when fresh, striate when dry; style linear 6.0–  
6.8 cm long, colored as stamens, stigma  
capitate to clavate, 3-lobed, 1–1.5 mm thick.  
Fruit trapezoidal or asymmetrically oblong to  
ovoid when immature, 10–15 mm long, 7–  
8 mm thick; mature fruits and seeds not seen.

**Paratypes:** MEXICO: YUCATÁN: Mpio. Che-  
max, 20 km de Valladolid rumbo a Puerto  
Juárez, 20° 40' N; 88° 00' 30" W, 2 Apr 1982  
R. Orellana 87 (CICY). Mpio. Izamal, Cenote  
Xcolak, unos 14–15 km al E de Izamal por la  
vía Tunkas, 20° 54' 50" N; 88° 50' W,  
flowering in cultivation, 15 Abr 2000 G.  
Carnevali and I. M. Ramírez 6208 (CICY).  
Mpio. Mérida. Jardín Botánico CICY, 21° 01'  
30" N; 89° 38' 30" W, 27 Mar 1998 R. Orellana  
950 (CICY). Mpio. Tinum, Jardín Botánico  
Balancanché, 20° 39' N; 88° 31' W, 20 Jan  
1990, S. Escalante 784 (CICY). Mpio. Uayma,  
Ejido Muel de Pixoy, enfrente del Rancho  
San Pedro, 20° 43' 30" N; 88° 22' 00" N, 31  
Mar 1984, E. Ucan, P. Galván and R. Lira  
3294 (CICY).

**Etymology.** From the Mayan “hunpet’ski-  
nil” (“el que se mancha con el sol”: the one  
that becomes spotted or stained with the sun)  
in reference to the fact that leaves become  
conspicuously blotched and tinged upon  
exposure to strong sunlight.

**Taxonomic relationships.** *Manfreda panicu-  
lata* is here hypothesized as the closest relative  
of *M. petskinil*. The latter species is a much  
smaller plant with a shorter, much less  
complex inflorescence. The species was cited  
by Verhoek-Williams (1975) (*R. S. Flores* 1, F;  
not seen by authors), Lott and García-  
Mendoza (1994), and Espejo-Serna and Ló-

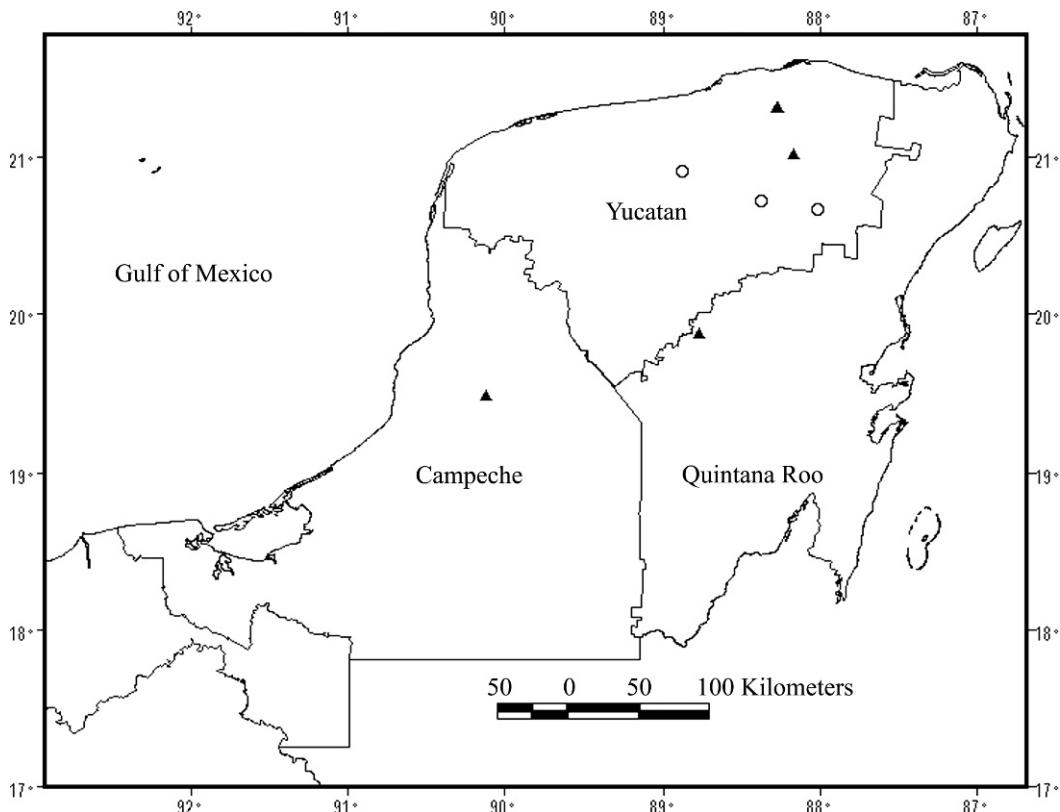


FIG. 5. Distribution of *Manfreda* in the Mexican Yucatan Peninsula. Triangles = *Manfreda paniculata*. Circles = *Manfreda petskinil*.

pez-Ferrari (1992) as *Manfreda variegata* (Jacobi) Rose, from which the new species differs by its puberulent and denticulate leaves, ascendant flowers, and filament insertion at tube mouth. *Manfreda petskinil* has also been confused in dry specimens with *M. scabra* (Ortega) McVaugh, but in this species the flowers are smaller with proportionally much shorter stamens (ca. 2–2.5 times longer than the perianth lobes vs. at least 3.5 times longer in *M. petskinil*), and the style is as thin as the stamens and barely distinguishable from them (*M. scabra* has styles much thicker than the stamens). The stamens in the new species are widely divergent as opposed to the commonly subparallel stamens of most *Manfreda* species. The flowers of *M. petskinil* are almost sessile but conspicuously pedicellate in *M. paniculata*. Phylogenetic analyses are required to address questions regarding the evolution of the point of insertion of the stamens on the corolla, and of the structure of the inflorescences within the Agavoideae, since these two new species

feature states in these characters that are intermediate between the genera *Manfreda* and *Agave*.

**Phenology and reproductive biology.** Flowers from January to April; fruits from March to June. Flowers are produced successively for about two weeks with 3–5 flowers simultaneously open per branch. We lack reliable data as to synchronicity of flowering under natural populations, but cultivated plants flower more or less asynchronously. Casual observations with cultivated plants at private collections and botanical gardens indicate either the need for pollinating vectors or autoincompatibility, since no fruits are produced naturally in these individuals. After flowering occurs, the inflorescence-bearing rosette activates an axillary meristem near the center of the rosette which pushes the main rosette laterally; thus, in a mature rosette leaves from different phenophases coexist. The plants also produce new lateral rosettes, eventually developing into

large clumps under favorable growing conditions.

**Distribution and habitat.** *Manfreda petskinil* is only known from a few localities at the NNE portion of the Mexican Yucatán Peninsula, all within the boundaries of the Yucatán State. It is apparently rare or only locally common. It occurs in open or shady areas over limestone rocky shallow soils (rendzines, “tzekel” in Mayan), growing associated with secondary or primary tropical deciduous to subdeciduous forests, often found close to the sinkholes (“cenotes”), from 5–30 m altitude. See Fig. 5 for distributional maps of both new species of *Manfreda*.

**Ethnobotany.** Fresh leaves of *Manfreda petskinil* are used against strong, permanent headaches by placing them over the forehead. The species is known by the common Mayan names “kabal ch’elem” (*E. Ucan, P. Galván and R. Lira* 3294, CICY),, meaning “dwarf Agave” and “humpets’kinil”, a name that suggested the specific epithet. *Manfreda petskinil* has an unrealized horticultural potential because of its handsome foliage and ease of growth under tropical conditions or in greenhouses in the temperate zone.

### Literature cited

- BOGLER, D. AND B. SIMPSON. 1996. Phylogeny of Agavaceae based on ITS rDNA sequence variation. *Am. J. Bot.* 83: 1225–1235.
- BOGLER, D. J., C. J. PIRES, AND J. FRANCISCO-ORTEGA. 2006. Phylogeny of Agavaceae based on *ndhF*, *rbcL*, and ITS sequences: implications of molecular data for classification pp. 313–328. In J. T. Columbus, E. A. Friar, J. M. Porter, L. M. Prince, and M. G. Simpson [eds.], *Monocots: Comparative biology and evolution. Excluding Poales*. Rancho Santa Ana Botanical Gardens, Claremont, CA. [Aliso 22: 313–328].
- BREMER, B., R. K. JANSEN, B. OXELMAN, M. BACKLUND, H. LANTZ, AND K.-J. KIM. 1999. More characters or more taxa for a robust phylogeny—case study from the coffee family (Rubiaceae). *Syst. Biol.* 48: 413–435.
- DURÁN, R., G. CAMPOS, J. C. TREJO, P. SIMÁ, F. MAY PAT, AND M. JUANQUI. 2000. Listado Florístico de la Península de Yucatán. Centro de Investigación Científica de Yucatán, A. C. Mérida, Yucatán, México. 259 p.
- EGUIARTE, F. L. E. 1983. Biología floral de *Manfreda brachystachya* (Cav.) Rose en el Pedregal de San Ángel, México. Tesis de Licenciatura, Universidad Nacional Autónoma de México, México, D.F.
- ESPEJO-SERRA, A. AND A. R. LÓPEZ-FERRARI. 1992. Las Monocotiledóneas Mexicanas: Una Sinopsis Florística. Part 1. Con. Nat. Flora Mex. A.C. Universidad Autónoma Metropolitana and Com. Nat. Biodiversidad, México. 76 p.
- GARCÍA-MENDOZA, A., A. CASTAÑEDA, AND S. FRANCO. 2000. *Manfreda littoralis* (Agavaceae) nueva especie de Guerrero y Oaxaca, México. *Acta Bot. Mex.* 50: 39–45.
- GENTRY, H. S. 1972. The Agave family in Sonora. Agriculture Handbook # 399. Agricultural Research Service. U. S. Department of Agriculture, Washington. 195 p.
- GOOD-ÁVILA, S. V., V. SOUZA, B. S. GAUT, AND L. E. EGUIARTE. 2006. Timing and rate of speciation in *Agave* (Agavaceae). *P. Natl. Acad. Sci. USA* 103: 9124–9129.
- HANNON, D. P. 2002. *Manfreda* and its allies. *Cactus and Succulent Journal* 74: 245–251.
- HERNÁNDEZ-SANDOVAL, L. 1993. Character analysis of the American Genera of Asparagales, a systematic study of *Beaucarnea* (Nolinaceae) and the taxonomic revision of *Hemiphylacus* (Hyacinthaceae). Ph.D. Thesis. Botany Department, University of Texas, Austin, TX.
- HERNÁNDEZ-SANDOVAL, L. 1995. Análisis cladístico de la familia Agavaceae. *Bol. Soc. Bot. Méx.* 56: 57–68.
- LOTT, E. J. AND VERHOEK, S. E. 1991. *Manfreda chameleensis* (Agavaceae: Poliantheae), new species from western Mexico. *Phytologia* 70: 366–370.
- LOTT, E. J. AND A. GARCÍA-MENDOZA. 1994. *Sansevieria* Thunb. 6, pp. 38–39. In G. Davidse, M. Sousa, and A. Charter [eds.]. *Flora Mesoamericana*. Universidad Nacional Autónoma de México, México, D.F.
- Orellana, R., L. Villers, V. Franco, and L. Ojeda. 1985. Algunos aspectos ecológicos de los Agaves de la Península de Yucatán, pp. 39–52. In C. Cruz, L. Del Castillo, M. Robert, and R. M. Ondarza [eds.]. Biología y aprovechamiento integral del henequén y otros agaves. Centro de Investigación Científica de Yucatán, A.C., Mérida, Yucatán.
- PAX, F. 1893. Eine neue Agavenart des Berliner botanischen Gartens. *Gartenflora* 42: 66–68.
- PIÑA-LUJÁN, I. 1985a. Consideraciones sobre el género *Manfreda* I. *Cact. Suc. Mex.* 30: 27–32.
- PIÑA-LUJÁN, I. 1985b. Consideraciones sobre el género *Manfreda* II. *Cact. Suc. Mex.* 30: 56–63.
- PIÑA-LUJÁN, I. 1985c. Consideraciones sobre el género *Manfreda* III. *Cact. Suc. Mex.* 30: 84–91.
- PIÑA-LUJÁN, I. 1986. Consideraciones sobre el género *Manfreda* IV. *Cact. Suc. Mex.* 30: 12–18, 34–35.
- SOSA, V., J. S. FLORES, V. RICO GRAY, R. LIRA, AND J. J. ORTIZ. 1985. Lista florística y sinonimia maya. *Etnoflora Yucatánense* I. Instituto Nacional de investigaciones sobre Recursos Bióticos, Xalapa, Veracruz, México. 225 p.
- SOUZA NOVELO, N. 1940. Henequén Ki. Instituto Agrícola Henequenero. Imp. Oriente, Mérida, Yucatán. 24 p.
- STANDLEY, P. C. 1930. *Flora of Yucatán*. Field Museum, Botanical Ser. 3: 1–492.
- THIEDE, J. AND U. EGGLI. 1999. Einbeziehung von *Manfreda* Salisbury, *Polianthes* Linné und *Proch-*