

differentiation from other *Manfreda* species elsewhere.

The genus *Manfreda* has been characterized as presenting spicate inflorescences and caducous leaves (Verhoek-Williams 1975, 1998). The two *Manfreda* species from the YBPB display conspicuously paniculate inflorescences, fleshy long-lasting leaves, and pedicellate flowers. Both species also differ from the rest of *Manfreda* in the presence of one or two separated bracteoles subtending the flowers. Even though these two species are different in many features, they seem to be more closely related to each other than to any other species of *Manfreda* or any other members of the subfamily Agavoideae. Thus, it is foreseeable that upon resolution of the relationships within the Agavoideae, these two species might be recognized as a supraspecific taxon within the subfamily.

Key to the species of *Manfreda* in the YBPB

1. Plants acaulescent or with a short stem with age; rosette 45–100 cm diameter; leaves somewhat rigid, 5–10 cm wide, lanceolate to lanceolate-triangular; dark, lustrous green, with dark reddish spots, glabrous, terminal spine conspicuous, soft; flowers with pedicels 3.5–4.5 mm long; stamens subparallel to slightly divergent at anthesis (forming a $< 30^\circ$ angle to the style), inserted at the floral tube *M. paniculata*
1. Plants always acaulescent, rosettes 30–50 cm diameter; leaves flaccid, less than 5 cm wide, linear-lanceolate to ensiform; glaucous, with white or reddish brown spots, minutely pubescent; terminal spine minute; flowers with pedicels ≤ 2 mm long; stamens widely divergent in anthesis (forming a $> 45^\circ$ angle to the style), inserted at or very close to the floral tube mouth *M. petskinil*

A species of *Manfreda*, under the name *Manfreda undulata* (Klotzsch) Rose (as *Agave undulata* Klotzsch) was cited by Standley (1930) as occurring in Yucatán. The data provided by this author are insufficient to determine to which of these two new species it should be referred. The type of *Manfreda undulata* is a mixed specimen of plants from *Agave* and *Manfreda*, and the flowers were

described “from memory” by Jacobi (Verhoek-Williams, 1975).

***Manfreda paniculata* L. Hernández., R. A. Orellana & G. Carnevali, sp. nov.** TYPE: MEXICO. Yucatán: 3 km al N de Panabá rumbo a San Felipe, 5–10 m, $21^\circ 18' 11''$ N; $88^\circ 16' 37''$ W; 2 dic 2006, L. Hernández, R. Orellana and G. Carnevali 5815 (Holotype, CICY, Isotypes, MO, QMEX). Fig. 1.

Species haec *Manfreda petskinil* sed planta majoris, foliis brevioris, proportione latioribus, inflorescentia multilongiores 3-pinnata, flores conspicue pedicellatis differt. Verosimiliter affinis cum *Manfreda maculosa* sed inflorescentia paniculata, foliis perennis, paulo canaliculatis, folia margine conspicue denticulata, aculeo terminali non coriacea et breviter tubo florali recedit.

Succulent, caulescent, perennial rosettofilious plants; rosettes 20–40 cm tall, 45–100 cm diameter, monocarpic, the plant grows through the production of axillary rosettes and stolons, mature inflorescences often produce bulbils on some of the distal meristems; **rhizomes** cylindrical to oblong 5–30 cm long, erect at maturity; rest of old leaves and thick fibers at the apex; **roots** thick, succulent; **leaves** 20–70, lanceolate to lanceolate-triangular, $20\text{--}55 \times 2.5\text{--}10.0$ cm, long-lasting, succulent (ca. 2.1 mm at the widest section of the leaf), channeled, the surface almost smooth, dark green, variegated with dark green to reddish brown spots, these more vivid on some individuals and on leaves exposed to bright light, apex long-attenuate with a flexible apical tip 1–2 cm long, apparently made-up of aggregated compacted fibers; margins sinuate, denticulate to spinulose with chartaceous teeth 0.5–1.0 mm in mature leaves. **Inflorescence** (1–)1.75–2.5(–3.8) m tall, paniculate; scape 0.5–1.8 m tall with 6–20 internodes, reddish-brown, glaucous; scape bracts 13–15 to ca. 2 cm long at the upper part, long triangular toward the base to deltoid, caducous, colored as leaves, rather succulent; reproductive part ovoid to pyramidal, 1–3 branched, rachis 0.2–2.0 m long; bracts subtending the branches triangular to deltate, 2–3 cm long; bracts subtending the floral peduncles deltoid, 2–4 mm long, papyraceous; bracteoles triangular, solitary, 1–3 mm long, papyraceous, pedicels 3.5–4.5 mm long. **Flowers** protandrous, solitary, almost geminate in some young branches, 3.0–3.5 cm long, pale dull



FIG. 1. *Manfreda paniculata* L. Hernández, R. Orellana & Carnevali. A. Flowering rosette. B. Axillary, adventitious branches at the basal nodes of peduncle. C. Flower during protandrous phase, longitudinal section: note filament insertion point. D. Fruiting panicle, upper half. E. Secondary branch showing different floral phenophases.

greenish yellow, glaucous outside, shiny pale green inside; perianth tube 6–8 mm long, narrow funnellform; perianth lobes $15\text{--}20 \times 1.5\text{--}3.5\text{--}(4)$ mm, ovate-lanceolate, apex obtuse, cucullate, tepal lobes reflexed during the

staminate phase of the flower, then erect, presenting incurved margins at maturity, apex with a tuft of glandular white trichomes, denser at the external part; stamens diverging from the style up to 30° at anthesis from the

style, insert at the base of the perianth tube, filaments filiform 4.0–5.5 cm long, dark shiny reddish-brown; anthers ca. 1.5 cm long, yellow to reddish, dorsifixed, versatile, curved after pollen dehiscence. **Ovary** cylindrical to fusiform 1.5–1.8 cm long, colored as the external part of tepals, angulate to striate, style filiform, 5.0–5.5 cm long, colored as stamens; stigma clavate to capitate, 3-lobed, 0.5 mm thick. **Fruits** capsular, oblong to obpyriform, 2.5–4.0 cm long, dark brown to almost black upon maturity, often with persistent perianth parts; seeds lunate, $6.0\text{--}9.0 \times 4\text{--}6$ mm, black, shiny, marginate.

Paratypes: MEXICO. **Campeche:** Mpio. Campeche, Pich, ca. 45 m, $19^{\circ} 29' 05''$ N; $90^{\circ} 07' 06''$ W, 30 Mar 1998, *B. Faust and P. Ucan 1023* (CICY). **Yucatán:** Mpio. Panabá, 1 km al N de Panabá rumbo a San Felipe, 5–10 m, 19 Mar. 1991, *R. Orellana 861* (CICY); Mpio. Calotmul, approx. $21^{\circ} 01' 08''$ N; $88^{\circ} 10' 28''$ W, no date, *G. Gaumer 959* (F, photo seen); Mpio. Mérida, Merida, 8–10 m, cultivated at a garden at Colonia México, $21^{\circ} 01' 01''$ N; $89^{\circ} 36' 00''$ W, 29 Mar. 1982, *R. Orellana 86* (CICY, XAL). CICY, Jardín Botánico Regional, 8–10 m, $21^{\circ} 01' 42''$ N; $89^{\circ} 38' 17''$ W, 30 Mar. 1999, *R. Orellana 954* (CICY); UACH, Temozón Norte, 6–8 m, $21^{\circ} 03' 52''$ N; $89^{\circ} 35' 41''$ W, 9 Jun 1987, *P. Colunga 350, 351* (CICY). **Quintana Roo:** Mpio. J. M. Morelos, Chichankanab, 47 m, approx. $19^{\circ} 52' 36''$ N; $88^{\circ} 46' 14''$ W, no date, *G. Gaumer 1543* (F, photo seen); $1^{\circ} 18' 46''$ N; $88^{\circ} 16' 44''$ W,

Etymology. The name refers to the broadly paniculate inflorescences typical of this species.

Phenology and reproductive biology. Flowers from November to March; fruits from November to April. Flowers are produced asynchronously among individuals in the same population, from November to March. Despite the large number of flowers, few fruits are set from the all the flowers, suggesting the requirement of vector-assisted pollination, as previously documented for other *Manfreda* species (Eguiarte 1983). Vegetative reproduction is by stolons and inflorescence bulbils. The stolons in large, mature, flowering rosettes may develop into lateral basal inflorescences, which in these cases arise for the

ground. The plants seem to resist fire under natural conditions.

Distribution and habitat. In open areas with limestone rocky shallow soils (“tzekel” in Mayan), growing associated with secondary tropical subdeciduous forests, often found at the surroundings of sink holes (“cenotes” or “dzonot”) or lakes, from 5–130 m altitude. The species seems restricted to the NE portion of the Mexican Yucatán Peninsula. The species is often cultivated (see below) and has been found in villages far removed for where natural populations are known to occur, such as Mérida, Mama, Dzityá (Yucatán State), and Pich (Campeche State), west of the populations known with certainty to be wild.

Taxonomic relationships. *Manfreda paniculata* is most unusual in the genus due to its huge, broadly paniculate inflorescences, solitary flowers subtended by a single bracteole, pedicellate flowers, and the production of bulbils. However, the flowers are typical of the genus *Manfreda* with stamens inserted at the base of the tube. Furthermore, the foliar texture, color, and spots are typical of the genus *Manfreda*, as well as the lack of a terminal, lignified spine. Fig. 2 compares the tube/tepale ideograms (sensu Gentry, 1972) of the two new taxa depicting the relative dimensions of the corolla tube and lobes. Fig. 3 provides a comparison of the leaf margins of the two new species. *Manfreda paniculata* is similar to *M. sileri* Verhoeck from which it differs by the presence of leaves fleshier and more rigid with shallow channels, larger marginal teeth, a soft spine-like tip, and shorter floral tube. *Manfreda haumiensis* (Boye-Petersen) Verhoeck, a larger plant with a spine-like tip, from the states of Morelos, Mexico, and Guerrero, differs from *M. paniculata* in the simple inflorescences (up to 3.8 m tall) and the longer perianth lobes (2.0–4.6 cm vs. 1.5–2.0 cm in *M. paniculata*).

Ethnobotany. *Manfreda paniculata* is reputed as medicinal, the leaves are used against headaches. It is also often grown as an ornamental, and it can be seen growing at houseyards and botanical gardens with few differences from those plants in the wild. It is locally known as “Pets’k’inil macho” (*B. Faust and P. Ucan 1023*, CICY) in Campeche, while in Yucatán it has been recorded as

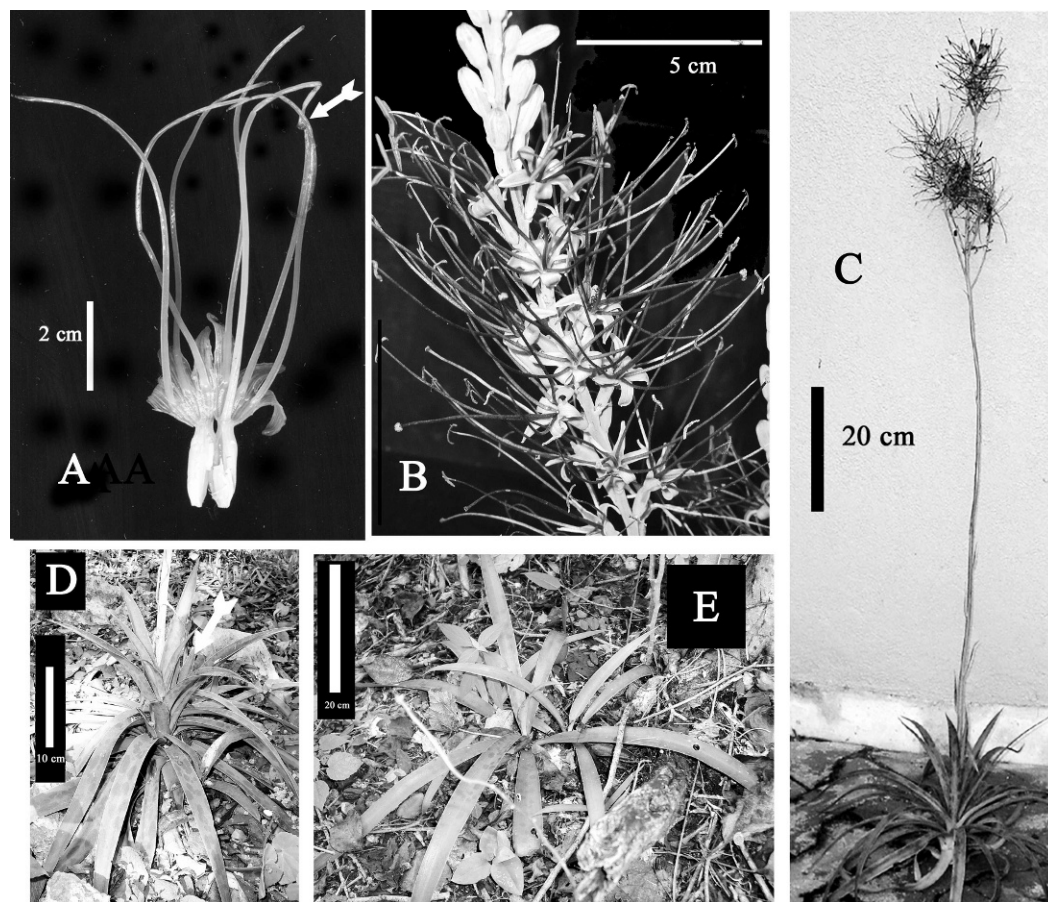


FIG. 2. *Manfreda petskinil* R. Orellana, L. Hernández & Carnevali. A. Flower during gynandrous phase, longitudinal section: note filament insertion point; arrow points stigma. B. Portion of inflorescence with several flowers showing different phenophases. C. Flowering plant: note paniculate inflorescence. 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° 54' 50" N, 88° 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 multibreuiore, floriis sessilibus differt. Verosimiliter affinis *Manfreda scabra* sed foliis perenniis, inflorescentia paniculata, stylo filiforme recedit.

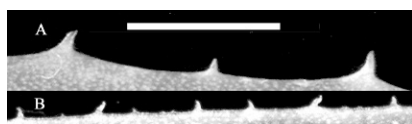


FIG. 3. Comparison of leaf-margins of the new manfredas. A. *Manfreda paniculata*. B. *Manfreda petskinil*.