



## Hesperoyucca AGAVACEAE

J. Thiede

**Hesperoyucca** (Engelmann) Trelease (Annual Rep. Missouri Bot. Gard. 4: 208, 1893). **Type:** *Yucca whipplei* Torrey. — **SHH-Clade** — **Lit:** Turner & al. (1995: ecology); Clary (2001: classification); Hochstätter (2000: 15–23, as sect. *Hesperoyucca*, ill. synopsis); Boeuf & al. (2009: 126–129, ill. synopsis); Powell (2013: summary pollination ecology). **Distr:** W USA, NW Mexico. **Etym:** Gr. ‘hespera’, evening; for the occurrence in W North America (i.e. in the West, where the sun disappears in the evening); and for the similarity to *Yucca* (*Agavaceae*).

≡ *Yucca* [?] *Hesperoyucca* Engelmann (1871).

≡ *Yucca* subgen. *Hesperoyucca* (Engelmann) Baker (1876).

Acaulescent rosette plants, monocarpic when remaining unbranched or polycarpic otherwise; **Ros** solitary or in colonies, sessile, sometimes stem rhizomatous, single or caespitose; **L** linear or rarely narrowly lanceolate, rigid and sword-like to flexible and frequently falcate, plano-convex or subtriquetrous, or keeled on both faces, 25–115 × 0.5–4 cm, ± grey-green, finely striate, base expanded to ± 4–7 × 4–7 cm, ± white to greenish, margin thin, horny, pale yellow, without fibres, mostly denticulate, terminal spine sharp;

**Inf** terminal large panicles, 1.4–8 m with a bracteate peduncle 0.9–4.5 m long, flowering part dense, cylindrical or somewhat slenderly ellipsoid; **Fl** densely arranged, usually broadly expanding, pendent, campanulate or ± globose, 3.5–5 cm, very fragrant; **Tep** broadly lanceolate, nearly equal, 3–4.5 (–6) × 0.8–2.5 cm, white or creamy white to greenish or purple-tinged, tips generally purple, free to the base; **Fil** straight, linear below, tip angled, club-like, papillose, attached to the lower part of the tepals so that the stamens are pulled away from the ovary as the flower opens; **Anth** reniform, pollen uniquely glutinous; **Ov** superior, stout, 8–12 × 6–10 mm; **Sty** short, slender, white; **Sti** distinctly capitate, green towards the centre, fringed with elongated translucent papillae; **Fr** erect, obovoid, strictly loculicidally dehiscent, 3–5 × 1.5–4 cm; **Se** flat, thin, smooth, without marginal wing, 6–7 × 8 mm, dull black. — **Cytology:** n = 30 (Halpin & Fishbein 2013: 1007).

With the exception of Trelease (1893) and indirectly also Baker (1892), most earlier authors included *Hesperoyucca* within *Yucca*. Recent molecular studies (Bogler & Simpson 1995, Bogler & al. 1995, Bogler & Simpson 1996, Bogler & al. 2006, Smith & al. 2008) and a combined morphological/molecular study (Clary & Simpson 1995) clearly revealed a position as sister group of *Hesperaloe* and thus separate from *Yucca*. In fact, the recent molecular phylogenies of Halpin & Fishbein (2013), Archibald & al. (2015) and McKain & al. (2016) all show *Hesperoyucca*

---

J. Thiede (✉)  
Hamburg, Germany  
e-mail: joachim\_thiede@gmx.de

as sister of *Hesperaloe* + *Schoenolirion*, in an *Agavaceae* subclade completely distant to that which includes *Yucca*. A closer association with *Yucca* is only evident in the molecular phylogeny of Good-Avila & al. (2006) and in the morphology-based phylogeny of Hernández-Sandoval (1995). Consequently, *Hesperoyucca* should be treated as separate genus, morphologically clearly distinct from *Yucca*, as in the first edition of this handbook and in several modern floras and checklists, while some still retain it as synonym of *Yucca*.

*Hesperoyucca* differs clearly from *Yucca* (data in brackets) in forming a definite bulb in the seedling stage (Webber 1953: t. 53) (vs. bulb absent), its capitate bright green and densely long-papillate stigma (vs. 3-lobed, white, papillose on the inner surface), its filaments basally attached to the tepals, usually longer than the pistil, finely papillate, and  $\pm$  swollen the entire length, erect or spreading outwardly from the point of attachment at anthesis, bearing tufts of papillae at the apex (vs. filaments not attached to the tepals, usually shorter than the pistil, pubescent, distally clavate and held close to the ovary and bent outwards near the swollen apex), its cordate anthers (vs. sagittate or hastate), and its strictly loculicidally dehiscent fruits (vs. indehiscent or, if dehiscent, septicidal, occasionally also septicidal and loculicidal). The often very large inflorescences of *Hesperoyucca* by far exceed the inflorescence size in *Yucca*, and unbranched plants (“ssp. *whipplei*”) are monocarpic, whereas some branched plants (“ssp. *caespitosa*”) develop new rosettes from the leaf axils of very young plants; both features are unknown in *Yucca*.

Author citation and date and place of valid publication were differently interpreted over time and have been clarified by Greenhouse & Strother (2002).

**Pollination:** Powell (2013) published a comprehensive summary of present knowledge of the pollination of *Hesperoyucca*: The *Yucca* moth *Tegeticula maculata* appears to be the only pollinator, with 3 distinct geographical races. Male moths usually stay in the same inflorescence for their whole life, while females usually translocate to other inflorescences (average 53 m distance). The plants are predominantly self-sterile.

**Ethnobotany:** According to Hodgson (2001, 43–44, ill.), *H. whipplei* was formerly used as food by the local populations in its range. The base of the inflorescence as well as the “heads” left when the leaves are pruned were roasted or baked, and then tasted like a fibrous sweet potato. Young flowers were also roasted and eaten.

**H. newberryi** (McKelvey) Clary (Sida 19(4): 845, 2001). **Type:** USA, Arizona (McKelvey 4087 [A]). — **Distr:** USA (Arizona: Mohave & Coconino Counties: W slopes of the Colorado River Canyon); rocky granite, 400–1300 m; spring-flowering. **I:** Hochstätter (2015: 3, 12, 15, as *Yucca*).

$\equiv$  *Yucca newberryi* McKelvey (1947)  $\equiv$  *Yucca whipplei* ssp. *newberryi* (McKelvey) Hochstätter (2000); **incl.** *Yucca newberryi* ssp. *mckelveyana* Hochstätter (2015).

Monocarpic; **Ros** solitary; **L** 50–60 cm, 0.7–2 cm wide at the base in narrow-leaved forms, 2–2.5 cm in broader-leaved forms; **Inf** 2.8–3.2 m, peduncle 1.4–1.6 m  $\times$  10–14 cm, floriferous part in the upper  $\frac{1}{2}$ , in outline 4–55 cm wide at the widest point; **Fr** woody capsules, at maturity with slight or inconspicuous placental wings.

**H. whipplei** (Torrey) Trelease (Annual Rep. Missouri Bot. Gard. 4: 208, 1893). **Type** [lecto]: USA, California (Schott s.n. [NY]). — **Lit:** Schaffer & Schaffer (1977: pollination ecology); Schaffer & Schaffer (1979: pollination ecology); Aker (1982: summary pollination ecology); Turner & al. (1995: 414–416, as *Yucca*); Powell (2013: summary pollination ecology). **Distr:** SW USA (SW California), NW Mexico (N Baja California, N Baja California Sur, NW Sonora: Pinacate region); coastal sage, chaparral, desert woodland, 0–1400 (–2500) m; flowers (February to) May–June. **I:** Greulich (2012); Hochstätter (2015: 5–10). – Figs. 1 and 2.

$\equiv$  *Yucca whipplei* Torrey (1859); **incl.** *Yucca californica* Groenland (1858); **incl.** *Yucca graminifolia* Alph. Wood (1868) (*nom. illeg.*, ICN Art. 53.1); **incl.** *Yucca engelmannii* Masters (1880); **incl.** *Yucca ortgiesiana* Roetzl (1880); **incl.** *Yucca whipplei* var. *violacea* André (1884); **incl.** *Hesperoyucca whipplei* var. *graminifolia* Trelease (1893)  $\equiv$  *Yucca whipplei* fa. *graminifolia*



**Fig. 1** *Hesperoyucca whipplei*. (Copyright: U. Eggli)



**Fig. 2** *Hesperoyucca whipplei*. (Copyright: U. Eggli)

(Trelease) Voss (1895); **incl.** *Yucca nitida* C. Wright ex W. Watson (1906); **incl.** *Yucca whipplei* var. *caespitosa* M. E. Jones (1929)  $\equiv$  *Yucca whipplei* ssp. *caespitosa* (M. E. Jones) A. L. Haines (1942); **incl.** *Yucca whipplei* var. *parishii* M. E. Jones (1929)  $\equiv$  *Yucca whipplei* ssp. *parishii* (M. E. Jones) A. L. Haines (1941); **incl.** *Yucca whipplei* ssp. *intermedia* A. L. Haines (1941)  $\equiv$

*Yucca whipplei* var. *intermedia* (A. L. Haines) J. M. Webber (1953); **incl.** *Yucca whipplei* ssp. *percursa* A. L. Haines (1941)  $\equiv$  *Yucca whipplei* var. *percursa* (A. L. Haines) J. M. Webber (1953); **incl.** *Yucca whipplei* ssp. *typica* A. L. Haines (1941) (*nom. inval.*, ICN Art. 24.3); **incl.** *Yucca peninsularis* McKelvey (1947)  $\equiv$  *Hesperoyucca peninsularis* (McKelvey) Clary (2001); **incl.** *Yucca whipplei* ssp. *eremica* Epling & A. L. Haines (1957); **incl.** *Yucca whipplei* ssp. *rigata* Afferni & Drovandi ex Afferni (2004).

Monocarpic and **Ros** solitary, or polycarpic and **Ros** caespitose and forming small to large, compact or open groups, sometimes rhizomatous, sometimes with secondary rosettes at the base or stem branching after flowering to form new rosettes; **L** 20–90 (–125)  $\times$  0.7–4 cm at the base; **Inf** 3–6 (–8) m, peduncle 0.9–3 (–4.5) m, 2.5–15 cm  $\varnothing$  near the base, floriferous part 2.5–2.8 m, 1 when rosettes are solitary, 1 to many per group when rosettes form colonies; **Fr** woody capsules, at maturity with conspicuous placental wings.

*Yucca californica* is here listed as synonym with considerable doubt and would have priority if it is indeed conspecific. Within *H. whipplei*, Trelease (1893) recognized 2 varieties, Haines (1941) and Munz & Keck (1959) each recognized 5 subspecies, and Webber (1953) recognized 4 varieties based on growth form. In contrast, McKelvey (1938) and McKelvey (1947) as well as McKinney & Hickman (1993) argued that growth form is highly variable and recognition of any infraspecific taxa in *H. whipplei* is unwarranted. Moreover, wild populations often contain plants of different “varieties” (Keeley & Tufenkian 1983), and seeds from one capsule may even produce all possible growth forms (DeMason 1984). Consequently, no infraspecific taxa are recognized here.

*H. peninsularis* from Baja California is sunk here following Govaerts (2014+, accessed Sept. 2018). The Californian and Mexican populations show a continuous distribution (Turner & al. 1995), the differences in leaf size given by Clary (2001) are contiguous, and material from Baja California (e.g. *Hodgson 9577* [DES, digital image!]) exhibits the conspicuous placental

wings present in the Californian plants but absent in *H. newberryi*.

Forms of *H. whipplei* from higher altitudes may be winterhardy in protected sites outdoors in C Europe and may reach flowering size in as little as 13 years (Bolliger 1998). The frost tolerance is given as about  $-15^{\circ}\text{C}$  in C Europe (Boeuf 2007) and to about  $-12^{\circ}\text{C}$  for the USA (Irish & Irish 2000). Wolf (1935) (cited from Hodgson (2001)) reports that rosettes need 6–7 years to reach flowering size.

## References

- Aker, C. L. (1982) Spatial and temporal dispersion patterns of pollinators and their relationship to the flowering strategy of *Yucca whipplei* (Agavaceae). *Oecologia* 54(2): 243–252. <https://doi.org/10.1007/BF00378399>
- Archibald, J. K. [& al. 2015], Kephart, S. R., Theiss, K. E., Petrosky, A. L. & Culley, T. M. (2015) Multilocus phylogenetic inference in subfamily *Chlorogaloideae* and related genera of *Agavaceae* — Informing questions in taxonomy at multiple ranks. *Molec. Phylogen. Evol.* 84: 266–283, ill., map. <https://doi.org/10.1016/j.ympev.2014.12.014>
- Baker, J. G. (1892) Agaves and arborescent *Liliaceae* on the Riviera. *Bull. Misc. Inform. Kew* 1892(61): 1–10. <http://www.jstor.org/stable/4102510>
- Boeuf, T. (2007) *Yucca* & Co. Winterharte Wüstengärten in Mitteleuropa anlegen und pflegen. Berlin (DE): Medemia.
- Boeuf, T. [& al. 2009], Bechtold, M. & Horn, K. (2009) Halbsträucher und Schopfbäume. *Yucca* und *Hesperoyucca*. Pforzheim (DE): Deutsche Kakteen-Gesellschaft.
- Bogler, D. J. & Simpson, B. B. (1995) A chloroplast DNA study of the *Agavaceae*. *Syst. Bot.* 20(2): 191–205. <http://www.jstor.org/stable/2419449>
- Bogler, D. J. & Simpson, B. B. (1996) Phylogeny of *Agavaceae* based on ITS rDNA sequence variation. *Amer. J. Bot.* 83(9): 1225–1235. <http://www.jstor.org/stable/2446206>
- Bogler, D. J. [& al. 1995], Neff, J. L. & Simpson, B. B. (1995) Multiple origins of the *Yucca* — *Yucca* Moth association. *Proc. Nation. Acad. Sci. USA* 92(15): 6864–6867, ill. <http://www.pnas.org/content/92/15/6864.full.pdf+html>
- Bogler, D. J. [& al. 2006], Pires, C. & Francisco-Ortega, J. (2006) Phylogeny of *Agavaceae* based on *ndhF*, *rbcl*, and ITS sequences: Implications of molecular data for classification. In: Columbus, J. T. & al. (eds.): *Monocots. Comparative biology and evolution excluding Poales*. *Aliso* 22: 313–328. <https://doi.org/10.5642/aliso.20062201.26>
- Bolliger, T. (1998) Nach 13 Jahren kam die Blüte: *Yucca whipplei* Torrey ssp. *parishii* in Mitteleuropa im Freiland gehalten. *Kakt. and. Sukk.* 49(8): 187–189, ill.
- Clary, K. H. (2001) The genus *Hesperoyucca* (Agavaceae) in the western United States and Mexico: New nomenclatural combinations. *Sida* 19(4): 839–847, ill. <https://biodiversitylibrary.org/page/9307939>
- Clary, K. H. & Simpson, B. B. (1995) Systematics and character evolution of the genus *Yucca* L. (Agavaceae): Evidence from morphology and molecular analyses. *Bol. Soc. Bot. México* 56: 77–88. <https://doi.org/10.17129/botsci.1466>
- DeMason, D. A. (1984) Offshoot variability in *Yucca whipplei* ssp. *percursa* (Agavaceae). *Madroño* 31: 197–202. <https://biodiversitylibrary.org/page/47946082>
- Good-Avila, S. V. [& al. 2006], Souza, V., Gaut, B. S. & Eguiarte, L. E. (2006) Timing and rate of speciation in *Agave* (Agavaceae). *Proc. Nation. Acad. Sci. USA* 103(24): 9124–9129. <https://doi.org/10.1073/pnas.0603312103>
- Govaerts, R. H. A. (comp.) (2014+) World checklist of selected plant families [continuously updated]. Richmond (GB): Trustees of the Royal Botanic Gardens, Kew. <http://apps.kew.org/wcsp>
- Greenhouse, J. A. & Strother, J. L. (2002) *Hesperoyucca whipplei* and *Yucca whipplei* (Agavaceae). *Madroño* 49(1): 20–21. <https://biodiversitylibrary.org/page/48190581>
- Greulich, M. (2012) *Hesperoyucca whipplei* (Torr.) Baker ex Trel. (1893) — ein Juwel der *Agavaceae*. *Berliner Kakt.-Blätt.* 12: 29–42.
- Haines, L. (1941) Variation in *Yucca whipplei*. *Madroño* 6: 33–64.
- Halpin, K. M. & Fishbein, M. (2013) A chloroplast phylogeny of *Agavaceae* subfamily *Chlorogaloideae*: Implications for the tempo of evolution on serpentine soils. *Syst. Bot.* 38(4): 996–1011, ill., map. <https://doi.org/10.1600/036364413X674850>
- Hernández-Sandoval, L. G. (1995) Análisis cladístico de la familia *Agavaceae*. *Bol. Soc. Bot. México* 56: 57–68.
- Hochstätter, F. (2000) *Yucca* I (Agavaceae) in the southwest and midwest of the USA and Canada. Mannheim (DE): Published by the author.
- Hochstätter, F. (2015) *Yucca* Section *Hesperoyucca* (Agavaceae). *Int. Cact.-Advent.* 106–107: 2–19, ill.
- Hodgson, W. C. (2001) Food plants of the Sonoran Desert. Tucson (US): University of Arizona Press.
- Irish, M. & Irish, G. (2000) Agaves, Yuccas and related plants. A gardener's guide. Portland (US): Timber Press.
- Keeley, J. E. & Tufenkian, D. A. (1983) Garden comparison of germinability and seedling growth of *Yucca whipplei* subspecies (Agavaceae). *Madroño* 31(1): 24–29.
- McKain, M. R. [& al. 2016], McNeal, J. R., Kellar, P. R., Eguiarte, L. E., Pires, J. C. & Leebens-Mack, J. (2016) Timing of rapid diversification and convergent origins of active pollination within *Agavoideae* (Asparagaceae). *Amer. J. Bot.* 103(10): 1717–1729. <https://doi.org/10.3732/ajb.1600198>

- McKelvey, S. D. (1938) *Yuccas of the Southwestern United States. Part I.* Jamaica Plain (US): Arnold Arboretum of Harvard University.
- McKelvey, S. D. (1947) *Yuccas of the Southwestern United States. Part II.* Jamaica Plain (US): Arnold Arboretum of Harvard University.
- McKinney, K. K. & Hickman, J. C. (1993) *Yucca*. In: Hickman, J. C. (ed.): *The Jepson Manual. Higher plants of California*; p. 1210. Berkeley etc. (US): University of California Press.
- Munz, P. A. & Keck, D. D. (1959) *A California flora.* Berkeley (US): University of California Press.
- Powell, J. A. (2013) Longevity and individual activity of the Yucca Moth, *Tegeticula maculata extranea* (Prodoxidae), based on mark-release monitoring. *J. Lepidopterists' Soc.* 67(3): 187–195, ills.
- Schaffer, W. M. & Schaffer, M. V. (1979) The adaptive significance of variations in reproductive habit in *Agavaceae*. II. Pollinator foraging behavior and selection for increased reproductive expenditure. *Ecology* 60: 1051–1069. <http://www.jstor.org/stable/1936872>
- Schaffer, W. M. & Schaffer, M. V. (1977) The adaptive significance of variations in reproductive habit in the *Agavaceae*. In: Stonehouse, B. (ed.): *Evolutionary Ecology*; pp. 261–276. London (GB): Macmillan.
- Smith, C. I. [& al. 2008], Pellmyr, O., Althoff, D. M., Balcázar-Lara, M., Leebens-Mack, J. & Segraves, K. A. (2008) Pattern and timing of diversification in *Yucca (Agavaceae)*: Specialized pollination does not escalate rates of diversification. *Proc. Roy. Soc. London, Ser. B, Biol. Sci.* 275: 249–258. <https://doi.org/10.1098/rspb.2007.1405>
- Trelease, W. (1893) Further studies of *Yuccas* and their pollination. *Annual Rep. Missouri Bot. Gard.* 4: 181–226, tt. 1–23. <https://doi.org/10.5962/bhl.title.33385>
- Turner, R. M. [& al. 1995], Bowers, J. E. & Burgess, T. L. (1995) *Sonoran Desert plants. An ecological atlas.* Tucson (US): University of Arizona Press.
- Webber, J. M. (1953) *Yuccas of the Southwest.* Washington D.C. (US): US Department of Agriculture. <http://archive.org/details/yuccasofsouthwes17webb>
- Wolf, C. (1935) *California plant notes. Part 1.* Occas. Pap. Rancho Santa Ana Bot. Gard. 1(1): 31–43.