

CACTACEAE

仙人掌科 xian ren zhang ke

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Fleshy perennials, shrubs, trees or vines, terrestrial or epiphytic. Stems jointed, terete, globose, flattened, or fluted, mostly leafless and variously spiny. Leaves alternate, flat or subulate to terete, vestigial, or entirely absent; spines, glochids (easily detached, small, bristlelike spines), and flowers always arising from cushionlike, axillary areoles (modified short shoots). Flowers solitary, sessile, rarely clustered and stalked (in *Pereskia*), bisexual, rarely unisexual, actinomorphic or occasionally zygomorphic. Receptacle tube (hypanthium or perianth tube) absent or short to elongate, naked or invested with leaflike bracts, scales, areoles, and hairs, bristles, or spines; perianth segments usually numerous, in a sepaloid to petaloid series. Stamens numerous, variously inserted in throat and tube; anthers 2-loculed, dehiscent longitudinally. Ovary (pericarpel) inferior, rarely superior, 1-loculed, with 3 to many parietal (rarely basal) placentas; ovules usually numerous; style 1; stigmas 2 to numerous, papillate, rarely 2-fid. Fruit juicy or dry, naked, scaly, hairy, bristly, or spiny, indehiscent or dehiscent, when juicy then pulp derived from often deliquescent funicles (except in *Pereskia*). Seeds usually numerous, often arillate or strophiolate; embryo curved or rarely straight; endosperm present or absent; cotyledons reduced or vestigial, rarely leaflike.

About 110 genera and more than 1000 species: temperate and tropical America; *Rhipsalis baccifera* (J. S. Mueller) Stearn native in tropical Africa, Madagascar, Comoros, Mascarenes, and Sri Lanka; some species of other genera now extensively naturalized in the Old World through human agency; more than 60 genera and 600 species cultivated as ornamentals or hedges in China, of which four genera and seven species more or less naturalized.

Li Zhenyu. 1999. Cactaceae. In: Ku Tsuechih, ed., Fl. Reipubl. Popularis Sin. 52(1): 272–285.

- 1a. Plants terrestrial; stems not producing aerial roots; leaves present; flowers diurnal, rotate, without elongated tube; ovary (pericarpel) superior to inferior.
 - 2a. Areoles without glochids; leaves broad and flat, pinnately nerved, ± persistent; flowers solitary or in inflorescences, mostly stalked; ovary (pericarpel) superior to inferior; seeds black, not arillate 1. *Pereskia*
 - 2b. Areoles with glochids; leaves usually small, terete to subulate, nerveless, caducous; flowers solitary, sessile; ovary (pericarpel) inferior; seeds encased in a white, bony aril 2. *Opuntia*
- 1b. Plants epiphytic, climbing, or scrambling; stems often producing aerial roots; leaves absent; flowers nocturnal, funnellform or salverform, with elongated tube; ovary (pericarpel) inferior.
 - 3a. Branches usually 3-winged or angled, rigid, with short spines or rarely spineless 3. *Hylocereus*
 - 3b. Branches usually flattened, leaflike, with a stout midrib, soft, spineless 4. *Epiphyllum*

1. PERESKIA Miller, Gard. Dict. Abr., ed. 4. 1754.

木麒麟属 mu qi lin shu

Shrubs or climbers, or trees to 20 m tall. Branches terete, slightly fleshy when young; areoles with spines; glochids absent. Leaves somewhat fleshy, sessile or petiolate, broad, flat, pinnately veined, estipulate. Flowers solitary, or in fasciculate, subcorymbose, racemose or paniculate inflorescences, stalked or sessile. Receptacle not produced into a tube beyond ovary, with numerous, ± leafy, often persistent scales. Perianth multiseriate; segments free, spreading or rotate, white to red, magenta or orange. Stamens numerous, inserted at base of perianth. Ovary (pericarpel) superior to inferior; placentas basal or parietal. Fruit globose, pear-shaped, or obovoid, fleshy, with or without scattered, leaflike scales. Seeds 2 to numerous; testa glossy black, brittle.

Seventeen species: tropical and subtropical America; five species cultivated as ornamentals in China, of which one species escaped from cultivation.

1. *Pereskia aculeata* Miller, Gard. Dict., ed. 8, *Pereskia* No. 1. 1768.

木麒麟 mu qi lin

Cactus pereskia Linnaeus, Sp. Pl. 1: 469. 1753.

Shrubs, at first erect, later clambering, 3–10 m tall. Areoles cushionlike and to 15 mm in diam. on trunk, 1.5–2 mm in diam. on twigs. Spines 1–3 per areole, on main branches acicu-

lar and straight, 1–4(–8) cm, on young branches additionally with 2 short, broadly based, recurved spines for climbing. Petiole 3–7 mm; leaf blade green or abaxially purplish, ovate, elliptic, or obovate, 4.5–7(–10) × 1.5–5 cm, glabrous, base cuneate to rounded, margin entire, apex shortly acuminate or acute; lateral veins 4–7. Flowers 3–4 cm in diam., fragrant (diosmin); pedicel 5–10 mm. Sepaloids pale green, ovate or obovate. Petaloids white to pale yellow, obovate to spatulate, 15–20 × 6–8 mm, margin entire, apex acute to truncate. Filaments white or

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golden, 5–7 mm; anthers yellow, 1–1.2 mm. Ovary superior; style white, 10–11 mm; stigmas 4–7, white, 3–4 mm. Fruit light yellow, obovoid or globose, 1–2 cm, spines eventually deciduous. Seeds 2–5, lenticular, 4.5–5 mm in diam., 1.4–1.6 mm thick.

Thickets beside railways; near sea level. S Fujian (Xiamen) [native to tropical America and the West Indies; widely introduced and escaped in tropical regions].

This species was first introduced to China in 1901.

2. *OPUNTIA* Miller, Gard. Dict. Abr., ed. 4. 1754.

仙人掌属 xian ren zhang shu

Nopalea Salm-Dyck.

Shrubs or small trees. Stems fleshy, usually many branched, terete, club-shaped, subglobose, laterally compressed; areoles with glochids and usually 1 to many spines. Leaves conic to terete, usually small, caducous. Flowers solitary, lateral or subterminal, rarely terminal, sessile. Receptacle obovoid, truncate and depressed at apex. Perianth rotate, spreading, or erect, inserted at rim of receptacle tube; segments numerous, outer ones sepaloid, inner ones petaloid. Stamens inserted in perianth throat, sensitive (except in *O. cochenillifera*). Ovary (pericarpel) inferior; placentas parietal. Fruit fleshy or dry, globose or ovoid, umbilicate, with areoles, glochids, and sometimes spines. Seeds encased in a white, hard, rarely hairy aril.

About 90 species: Americas; at least 30 species cultivated in China, of which four naturalized in southern and southwestern areas.

- 1a. All perianth segments erect, red; stamens erect, longer than perianth, filaments and anthers red 4. *O. cochenillifera*
 1b. Inner perianth segments spreading, yellow to orange; stamens spreading, but sensitive, closing around style when touched, shorter than perianth, filaments greenish or yellowish to white, anthers yellow.
 2a. Areoles of mature, ultimate joints with (1–)3–10 spines, spines yellow, ± brown banded or mottled, subulate, straight to curved, stout, usually flattened at base; petaloids lemon-yellow; stigmas 5 1. *O. dillenii*
 2b. Areoles of mature, ultimate joints with 1–5 spines, spines white to grayish to reddish brown, aciculate, terete, sometimes absent; petaloids yellow to orange; stigmas 6–10.
 3a. Joints dull green or grayish green, margins ± entire, spineless or with 1–5 white spines; mature fruit barrel-shaped 2. *O. ficus-indica*
 3b. Joints glossy green, margins undulate toward apex, spines gray to reddish brown with darker tips; mature fruit obconic to obovoid 3. *O. monacantha*

1. *Opuntia dillenii* (Ker Gawler) Haworth, Suppl. Pl. Succ. 79. 1819.

仙人掌 xian ren zhang

Cactus dillenii Ker Gawler, Bot. Reg. 3: t. 255. 1818; *Opuntia stricta* (Haworth) Haworth var. *dillenii* (Ker Gawler) L. Benson.

Shrubs sprawling or erect, 1–3 m tall. Trunk absent or short. Larger, terminal joints green to gray-green, obovate or elliptic-obovate to suborbicular, 10–35(–40) × 7.5–20(–25) cm. Areoles 2–9 mm in diam. Spines 1–12(–20) per areole on most areoles, spreading, yellow, ± brown banded or mottled, subulate, straight or curved, 1.2–4(–6) cm, basally flattened; glochids yellow. Leaves subulate, 4.5–6 mm, deciduous. Flowers 5–9 cm in diam. Sepaloids greenish with yellow margin, broadly deltoid-obovate to obovate, 10–25 × 6–12 mm, margin entire or slightly crisped, apex mucronate. Petaloids spreading, bright yellow, obovate or cuneate-obovate, 25–30 × 12–20 mm, margin entire or slightly undulate, apex rounded, truncate, or emarginate. Filaments yellow, ca. 12 mm; anthers yellow, ca. 1.5 mm. Style yellow or yellowish, 12–20 mm; stigmas 5, pale green, ca. 4.5 mm. Fruit purple, turbinate to obovoid, 4–6 × 2.5–3(–4) cm, fleshy at maturity, umbilicus deep. Seeds light tan, irregularly orbicular, 4–5 × 4–4.5 mm. Fl. Jun–Oct(–Dec).

Thickets, rocks, sandy soils, also cultivated as a hedge; near sea level. S Guangdong, S Guangxi, Hainan [native to the Caribbean region; widely introduced and naturalized in tropical regions].

This species was first recorded in China in 1702.

2. *Opuntia ficus-indica* (Linnaeus) Miller, Gard. Dict., ed. 8, *Opuntia* No. 2. 1768.

梨果仙人掌 li guo xian ren zhang

Cactus ficus-indica Linnaeus, Sp. Pl. 1: 468. 1753; *C. chinensis* Roxburgh; *Opuntia chinensis* (Roxburgh) K. Koch.

Shrubs erect or small trees, 1.5–5 m tall. Trunk (when present) terete. Joints dull green or grayish green, broadly to narrowly obovate, elliptic, or oblong, (20–)25–60 × 7–20 cm, thick. Areoles usually narrowly elliptic, 2–4.5 mm. Spines usually absent, sometimes 1–6 per areole, spreading or deflexed, bristle-like or acicular, 0.3–3.2 cm, basally flattened; glochids yellow, early deciduous. Leaves conic, 3–4 mm, early deciduous. Flowers 5–8 cm in diam. Sepaloids yellow with reddish or green center, broadly ovate or obovate, to 2 cm, margin entire or denticulate, apex truncate or acute, mucronate. Petaloids spreading, yellow to orange, obovate to oblong-obovate, 2.5–3.5 × 1.5–2 cm, margin entire or erose, apex rounded, truncate, mucronate, or emarginate. Filaments yellowish, ca. 6 mm; anthers yellow, 1.2–1.5 mm. Style greenish, ca. 15 mm; stigmas (6–)7–10, cream, 3–4 mm. Fruit yellow, orange, or purplish, 5–10 × 4–9 cm, umbilicus low and concave. Seeds gray or tan, elliptic-orbicular, 4–5 × 3.5–4 mm. Fl. May–Jun.

Hot dry valleys, rocks; 600–2900 m. W Guangxi, SW Guizhou, SW Sichuan, SE Xizang, Yunnan [of cultivated origin in Mexico ca. 9000 years ago; widely introduced as a hedge or for its edible young joints and fruit; naturalized in tropical and subtropical regions].

This species was first introduced to China in 1645.

3. *Opuntia monacantha* Haworth, Suppl. Pl. Succ. 81. 1819.

单刺仙人掌 dan ci xian ren zhang

Cactus monacanthos Willdenow, Enum. Pl. Suppl. 33. 1814; *C. indicus* Roxburgh.

Shrubs or treelike, 1.3–4 m tall. Trunk (when present) terete. Larger, terminal joints glossy green, obovate, narrowly so, obovate-oblong, oblong, or oblanceolate, 10–30 × 7.5–12.5 cm, thin, narrowed basally, margin undulate toward apex. Areoles 3–5 mm in diam. Spines sparse on joint 1 or 2 (or 3) per areole, but on main trunk to 12 per areole, erect or spreading, grayish, dark brown tipped, acicular, 1–7.5 cm; glochids brownish, 2–3 mm. Leaves conic, 2–4 mm, deciduous. Flowers 5–7.5 cm in diam. Sepaloids with red midrib and yellow margin, obovate or broadly ovate, 0.8–2.5 × 0.8–1.5 cm, apex rounded or emarginate. Petaloids spreading, yellow to orange, or obovate to oblong-obovate, 2.3–4 × 1.2–3 cm, margin subentire, apex rounded, truncate, or mucronate. Filaments greenish, ca. 12 mm; anthers pale yellow, ca. 1 mm. Style greenish, 1.2–2 cm; stigmas 6–10, cream, 4.5–6 mm. Fruit reddish purple, obovoid, 5–7.5 × 4–5 cm, umbilicus slightly depressed. Seeds light tan, irregularly elliptic, ca. 4 × 3 mm. Fl. Apr–Aug.

Seashores, slopes; sea level to 2000 m. Fujian, Guangdong, Guangxi, Taiwan, Yunnan [native to Argentina, Brazil, Paraguay, and Uruguay; widely introduced and naturalized in tropical and subtropical regions].

This species was first recorded in China in 1625.

When describing *Opuntia monacantha*, Haworth based the name on a plant from Barbados, where only *O. dillenii* is currently recorded as native. Haworth's name has now been neotypified to maintain its use in the sense employed here and is the earliest name consistently applied to this widely introduced plant, which is native to SE South America.

Haworth cited *Cactus monacanthos* Willdenow 1814 in synonymy with a “?” but this indication of doubt rules out Willdenow's untypifiable name as a potential basionym for that of Haworth. An earlier name formerly and widely applied to *O. monacantha* is *O. vulgaris* Miller. This confused name has now been typified to become a synonym of *O. ficus-indica* (Linnaeus) Miller (see Leuenberger, Taxon 42: 419–429).

4. *Opuntia cochenillifera* (Linnaeus) Miller, Gard. Dict., ed. 8, *Opuntia* No. 6. 1768.

胭脂掌 yan zhi zhang

Cactus cochenillifer Linnaeus, Sp. Pl. 1: 468. 1753; *Nopalea cochenillifera* (Linnaeus) Salm-Dyck.

Shrubs or small trees, 2–4 m tall. Trunk (when present) terete. Large joints green, elliptic to narrowly obovate, 8–40(–50) × 5–7.5(–15) cm, thick, margin entire, base and apex rounded. Areoles ca. 2 mm in diam. Spines usually absent, when present: 1–3 per areole, spreading, grayish tan, acicular, 3–9 mm; glochids early deciduous. Leaves conic, 3–4 mm, early deciduous. Flowers 1.2–1.5 cm in diam., erect. Sepaloids with brilliant red or green midrib, largest ones ovate-deltoid, 5–12 × 6–9 mm, margin entire, apex acute. Petaloids bright red, ovate to obovate, 1.3–1.5 × 0.6–1 cm, margin entire or undulate, apex rounded or acute. Filaments pink, 3–4 cm; anthers pink, ca. 1.5 mm. Style pink, 4–4.5 cm; stigmas 6–8, greenish, ca. 3 mm. Fruit red, ellipsoid, 3–5 × 2.5–3 cm, umbilicus developed but not conspicuous. Seeds gray or tannish, thickened discoid, ca. 3 mm in diam. Fl. Jul–Feb.

Slopes; low altitudes. S Guangdong, Guangxi, Hainan [native to Mexico; widely introduced and escaped in tropical regions].

This species was first introduced to China in 1901. Some authorities now recognize this species in the genus *Nopalea*, as distinct from *Opuntia*, based on pollen-morphological differences.

3. HYLOCEREUS (A. Berger) Britton & Rose, Contr. U.S. Natl. Herb. 12: 428. 1909.

量天尺属 liang tian chi shu

Cereus subg. *Hylocereus* A. Berger, Rep. (Annual) Missouri Bot. Gard. 16: 72. 1905.

Plants climbing, scrambling, or epiphytic. Stems branched, usually 3-winged or -angled, margins often horny, often producing numerous aerial roots. Areoles spaced far apart in notches along wings or angles. Spines short or rarely absent. Leaves absent. Flowers usually nocturnal, white or rarely red, funnelliform, large. Receptacle tube usually elongate, stout, with broad, leaflike scales. Stamens numerous, inserted in receptacle tube and perianth throat, shorter than perianth. Placentas parietal; stigmas numerous, sometimes 2-fid or flabellate. Fruit globose, ellipsoid, or ovoid, large, fleshy, spineless, with broad scales. Seeds numerous, ovate-reniform; testa glossy black, smooth or minutely spotted.

About 15 species: from Mexico and the West Indies to South America; four species cultivated in China, of which one species naturalized in southern areas.

1. *Hylocereus undatus* (Haworth) Britton & Rose, Fl. Bermuda, 256. 1918.

量天尺 liang tian chi

Cereus undatus Haworth, Philos. Mag. Ann. Chem. 7: 110. 1830.

Plants clambering or sprawling. Stems deep green, 3–15 m. Joints 20–50 × 3–8(–12) cm, winged or angled, margins of wings or angles coarsely crenate, horny. Areoles 3–6 cm apart,

2–5 mm in diam. Spines 1–3(–6) per areole, spreading in various directions, gray-brown, conic to subulate, 2–5(–10) mm. Flowers 25–30 × 15–34 cm. Receptacle tube funnelliform. Sepaloids with greenish midrib and mostly white margin, lanceolate-linear to linear, 10–15 × 1–1.5 cm, margin entire, apex acuminate, reflexed. Petaloids erect to spreading, white, narrowly oblanceolate, margin entire or erose. Filaments cream, 5–7.5 cm; anthers linear, ca. 4.5 mm. Style cream, 14–20 cm, stout; stigmas 20–24, exserted, 2–2.3 mm, slender. Fruit red, globose to ellipsoid, 7–12.5 × 6–12 cm, with numerous triangular scales,

umbilicus small; pulp white. Seeds obovate, ca. 2×1 mm. Fl. July–Dec.

Trees, rocks, maritime scrub; sea level to 300 m. S Fujian, S Guangdong, SW Guangxi, Hainan, Taiwan [perhaps native to Mexico

and Central America; widely introduced and escaped in tropical Asia, E Australia, and South America].

This species was first introduced to China in 1645. It is usually cultivated as a hedge, or for its edible fruit. The flower is often eaten in a vegetable soup in S Guangdong.

4. **EPIPHYLLUM** Haworth, Syn. Pl. Succ. 197. 1812.

昙花属 tan hua shu

Phyllocactus Link, nom. illeg. superfl.

Plants mostly epiphytic. Old stems woody at base, often terete; branches usually flattened and leaflike, or 3-winged, with stout midrib, margins crenate, coarsely serrate, or lacerate, sometimes horny. Areoles seated between crenations of stem margins, woolly when young, setose in juvenile growth. Leaves and spines absent. Flowers nocturnal, borne in lateral areoles, solitary, sessile, funnelform or salverform, usually large. Receptacle tube elongate, with scattered scales. Perianth spreading to rotate; segments usually linear-lanceolate. Petaloids white; outer ones often recurved, sometimes cream or pinkish. Stamens numerous; filaments inserted in receptacle tube and perianth throat; anthers exerted. Placentas parietal; style elongate; stigmas numerous, exerted, linear. Fruit green, red, or purplish, globose to cylindric, usually fleshy, with low ridges bearing scales, usually splitting along one side when ripe. Seeds numerous, ovate-reniform; testa glossy black, minutely wrinkled or spotted.

About 13 species: tropical America; four species cultivated in China as ornamentals, of which one species occasionally escaped from cultivation in tropical areas.

1. *Epiphyllum oxypetalum* (Candolle) Haworth, Philos. Mag. Ann. Chem. 6: 109. 1829.

昙花 tan hua

Cereus oxypetalus Candolle, Prodr. 3: 470. 1828; *Phyllocactus oxypetalus* (Candolle) Link ex Walpers.

Shrubs epiphytic, freely branched, 2–6 m tall, with aerial roots. Old stems and basal extension shoots terete, to 2 m or more, woody; branches numerous, dark green, laterally flattened, leaflike, lanceolate to oblong-lanceolate, $15\text{--}100 \times 5\text{--}12$ cm, glabrous, base cuneate, attenuate, or stalked, margin undulate to deeply crenate, apex acute to acuminate; midrib 2–6 mm wide, stout. Areoles small, spineless. Flowers nocturnal, fragrant, funnelform, $25\text{--}30 \times 10\text{--}27$ cm. Receptacle tube 13–18

cm, base green, 4–9 mm in diam., slightly angled, with triangular to lanceolate scales 3–10 mm. Sepaloids often recurved, pale green or pinkish red, linear to oblanceolate. Petaloids white, oblanceolate to obovate, $7\text{--}10 \times 3\text{--}4.5$ cm. Filaments white, 2.5–5 mm; anthers cream, 3–3.5 mm. Style white, 20–22 cm; stigmas 15–20, cream, narrowly linear, 1.6–1.8 mm. Fruit rare, purplish red, oblong, ca. 16×5.7 cm. Seed $2\text{--}2.5 \times$ ca. 1.5 mm. Fl. Jun–Oct.

Escaped from cultivation in tropical areas; 1000–1200 m. S Yunnan (Jinghong) [native to Mexico and Guatemala; widely introduced elsewhere as an ornamental].

This species was first introduced to China in 1645, and the naturalized plant was first recorded in Jinghong, Yunnan, in 1936. The mucilaginous flower is often eaten in a vegetable soup.