

5. *Cylindropuntia pallida* (Rose) F.M.Knuth

In: Backeberg & Knuth *Kaktus-ABC*: 122 (1936).

=*Opuntia pallida* Rose

=*Opuntia rosea* sensu auct. non DC. (misapplied name)

Common names: rosea cactus (in South Africa somewhat confusingly used for *C. fulgida* var. *fulgida*), Hudson pear (in Australia, J.R. Hosking, *pers. comm.*) (English); roseakaktus (in South Africa somewhat confusingly used for *C. fulgida* var. *fulgida*) (Afrikaans).

Shrub, branching basally with ascending stems, (0.2–)0.5–1 m tall (1.5 m in Australian form); branch segments cylindrical, 10–15 × 1.6–2.5 cm, grey-green; tubercles distinct; areoles large, 2–3.5 cm apart; glochidia 2–5 mm long, yellow. Spines (1–)4–9, acicular, 1–4 cm long, yellow, reddish or grey; sheaths papery, yellowish, not completely covering the spines. **Flowers** 3.8–4 mm long, pink. **Fruit** obconical to obovoid, 1.6–1.8 × 1.1–1.4 cm, tuberculate, spiny, yellow.

Distribution: B, N, SA. (Fig. 130)

References: Britton & Rose (1963), Anderson (2001).

Hunt *et al.* (2006) described *Opuntia pallida* as appearing to be 'a deep pink-flowered form of *C. tunicata*' and listed it as a synonym of *Cylindropuntia rosea*. *Cylindropuntia pallida* appears to be geographically isolated from *C. tunicata* of the Chihuahuan Desert (Pinkava, 2003a). The host-adapted cochineal insects also suggest that they are distinct species. The cochineal from *C. pallida* does not develop on *C. imbricata* and *C. tunicata* and the converse applies to the cochineal on *C. imbricata* (Mathenge *et al.*, 2010). This strong specificity indicates that conspecificity or hybrid origin are unlikely.

This taxon has for a long time been treated under the name *Opuntia rosea*, following Mexican usage, e.g. Bravo-Hollis (1978). That name seems better placed as a synonym of *C. imbricata*, judging by the illustrations (Rowley, 1994) that were

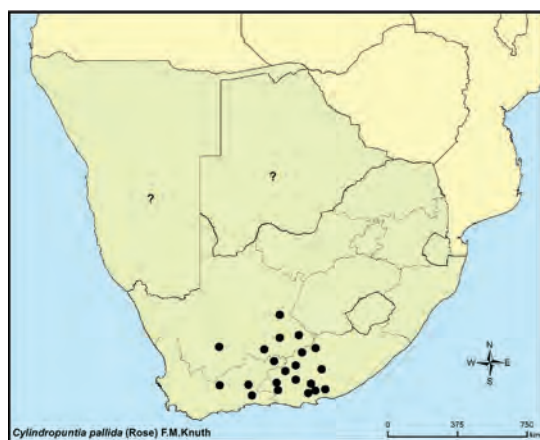


Fig. 130. Distribution map of *Cylindropuntia pallida* (Rose) F.M.Knuth.

cited by De Candolle (1828). As any changes from a name in wide and current use could cause disruption, an alternative to using the currently correct name *O. pallida*, is that the name *C. rosea* (based on a painting of *C. imbricata*) is formally proposed to be conserved with a new type, in order to fix the application of the name to the Mexican taxon that has been the subject of most literature treatments.

Although plants are usually low growing (Fig. 131), some plants have been reported to reach up to 1.5 m high in Australia (Hosking *et al.*, 2007). In South Africa this species has sometimes been referred to under the name *C. tunicata* and it has also been confused with *Cylindropuntia fulgida*. The juvenile plants of these three cholla species are similar looking and with our current knowledge, can only be visually distinguished from each other by their flower tepal colour once they are mature enough to flower. *C. pallida* has pink (rose coloured) flowers (Fig. 132) whilst those of *C. tunicata* are yellow or yellowish green (Anderson, 2001; Hunt, 2006). *C. tunicata* is consistently low-growing as opposed to the taller *C. pallida*.

Cylindropuntia pallida is native to the provinces of Hidalgo, Mexico, Puebla and Tlaxcala of central Mexico. It can form dense stands in its natural range due to disturbance such as overgrazing. It has become invasive and has naturalised in New South Wales, Australia (Hosking *et al.*, 2007).

The species is used as a barrier plant in Namibia, and has recently also been recorded in Botswana. In South Africa it is known to be cultivated for decoration in drier regions (Fig. 133). Low-growing plants recorded in the Northern and Eastern Cape near Addo, Jansenville, Cradock, Graaff-Reinet, Murraysburg and Victoria West may belong to this species, but require verification as either *C. pallida* or *C. tunicata*. Populations from Jansenville, and from the Western Cape near Oudtshoorn, have been confirmed as *C. pallida*.

Cylindropuntia pallida spreads by the movement of easily detachable segments, especially by flood waters. The plant has long spines with detachable sheaths that are a hazard to grazing animals. Since segments are easily detached, they can be dispersed (as burrs) via vehicle tyres. The fruit (Fig. 134) bears sterile (abortive) seeds but individual fruit can root and form new plants, enhancing vegetative spread.

This plant is currently not listed as a weed in South Africa. Research on biological control of *C. pallida* has commenced in Australia (as *C. rosea*) and South Africa could in future collaborate on this initiative. So far, *C. tunicata* is only known in South Africa as a horticultural subject, but has been proposed to be listed under CARA and NEMBA similarly to *C. pallida* or *C. fulgida* (Anonymous, 2009). This proposal is supported by the fact that *C. tunicata* has already become naturalised in Australia, Argentina, Chile, Ecuador and Peru (Hunt, 2006).



Fig. 131. *Cylindropuntia pallida* (Rose) F.M.Knuth has a low growing habit.
(Picture by Barbara K. Mashope)



Fig. 132. Flower of *Cylindropuntia pallida* (Rose) F.M.Knuth.
(Picture by Barbara K. Mashope)



Fig. 133. *Cylindropuntia pallida* (Rose) F.M.Knuth spreading from abandoned homestead. (Picture by Barbara K. Mashope)



Fig. 134. Fruit of *Cylindropuntia pallida* (Rose) F.M.Knuth. (Picture by Barbara K. Mashope)

6. *Cylindropuntia spinosior* (Engelm.) F.M.Knuth

In: Backeberg & Knuth *Kaktus-ABC*: 122 (1936).

Common names: cane cholla, spiny cholla (English).

Compact shrubs, tree-like, 0.4–2.0 m tall; branches whorled, segments 5–23 cm long, 1.3–3.5 cm in diameter, green to purplish; tubercles oval, usually 5–15 mm high, crowded; areoles often elliptical, wool yellow to tan, ageing darker; glochidia inconspicuous, 1–2 mm long, yellow to tan, ageing grey. Spines 4–24, on most areoles, interlacing, tan to pink to reddish brown; sheaths whitish, baggy.

Tepals spatulate, rose, reddish purple, bronze purple, whitish, yellow or salmon-coloured. **Fruit** broadly cylindrical, 2–5 × 1.7–3 cm, fleshy, rarely proliferating, strongly tuberculate, with 28–50 or more areoles, tubercles longer in distal portion, yellow to almost orange when ripe, sometimes tinged with purple. **Distribution:** SA. (Fig. 135)

References: Hunt *et al.* (2006).

Cylindropuntia spinosior (Fig. 136, 137, 138) is very similar to *Cylindropuntia imbricata*, and differences are discussed under that species. Though its description is very similar to that of non-crested forms of *Cylindropuntia fulgida* var. *mamillata*, the latter is readily distinguished by its easily detached terminal segments, recurved tepals and proliferous fruit chains.

It occurs in dry grassland and desert in a range (Pinkava, 2003a; Hunt, 2006) between and overlapping those of *C. fulgida* to the west (Sonoran Desert), and *C. imbricata* to the east (Chihuahuan Desert), from Arizona and New Mexico (USA) to Sonora and Chihuahua (Mexico). Hybrids are formed in the overlapping areas, particularly with *C. imbricata* (Pinkava, 2003a).

Cylindropuntia spinosior is sometimes cultivated in South Africa, and has now been found to be naturalised near Hopetown and Pofadder (Northern Cape Province) and east of Beaufort West (Western Cape Province). Even though this species is not a declared weed in South Africa, it requires monitoring.



Fig. 135. Distribution map of *Cylindropuntia spinosior* (Engelm.) F.M.Knuth



Fig. 136. *Cylindropuntia spinosior* (Engelm.) F.M.Knuth.
(Picture by Helmuth G. Zimmermann)



Fig. 137. Flower of *Cylindropuntia spinosior* (Engelm.) F.M.Knuth.
(Picture by Helmuth G. Zimmermann)



Fig. 138. Fruit of *Cylindropuntia spinosior* (Engelm.) F.M.Knuth.
(Picture by Helmuth G. Zimmermann)

***Echinopsis* Zucc.**

Shrubby, columnar; branches erect, ascending, sometimes toppling over, simple, distinctly ribbed, very spiny; ribs numerous. **Flowers** subapical, elongate-funnelform, nocturnal or diurnal, large; pericarpel and hypanthium with relatively narrow, often numerous scales; pericarpel areoles more or less densely hairy. **Stamens** numerous. **Fruit** globose, fleshy. **Seed** broadly ovoid to orbicular, 1.2–1.6 × 0.8–1.4 mm, black-brown, matt, relief flat to low-domed.

Reference: Hunt *et al.* (2006).

A large genus endemic to South America, but with uncertain and fluctuating limits involving over 500 species names. The number of accepted species has been reduced from Anderson's (2001) count of 128 to 77 (Hunt, 2006). This figure, despite a broader generic concept than earlier, is the result of combining taxa, reducing species to subspecies, or of rejecting names of irreconcilable application.

In South Africa, the genus is easily recognised by the clumps of densely reddish- to golden, spiny, simple, columnar stems usually more than 8 cm in diameter.

***Echinopsis schickendantzii* F.A.C.Weber**

In: *Dictionnaire d'Horticulture* 473 (1896).

= *Trichocereus schaferi* Britton and Rose

Common names: columnar torch cactus, torch cactus (English); orrelkactus (Afrikaans).

Multistemmed shrubs 1–1.7(–2.5) m tall; stems green, columnar, (6–)8–10(–13) cm in diameter, branching from base or below ground (rarely above ground); ribs 10–15, c. 1.3 cm high, margins relatively straight or evenly spiral; areoles c. 1–1.5 (–2.5) cm apart, with curly yellow wool. Spines straight, yellow or reddish yellow when young, ageing brown or whitish; central spine single, 1.1–2(–2.7) cm long, peripheral spines 8–10, (4–)6–10 mm long, thin, sharp. **Flowers** from Nov. to Mar., showy, 18–20 cm long, mouth up to c. 15 cm in diameter; tepals white; pericarpel and hypanthium covered with long, dark hairs; pericarpel areoles densely hirsute in upper half. **Fruit** spherical, c. 5 cm long, green, remaining clothed with long, dark hairs of pericarpel and conspicuous, persistent hypanthium, dehiscent along one side; pulp white. **Seed** small, dull black-brown (virtually black), more or less warty, mostly sterile. **Distribution:** B, N, SA. (Fig. 139)

References: Anderson (2001), Henderson (2001), as *Echinopsis spachiana* (Lem.) Friedrich & G.D.Rowley (sp. insufficiently known).

This species can be distinguished from other naturalised, densely spiny, columnar cacti in South Africa by the wide stems with subapical flowers, and long, blackish hairs obscuring the pericarpel (Fig. 140). This plant was previously known in southern Africa by the name *Echinopsis spachiana*, which appeared to have been distinguished from *E. schickendantzii* only by the height of the stem (Fig. 141),

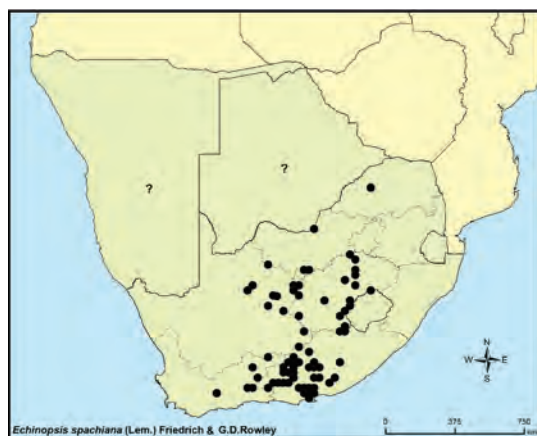


Fig. 139. Distribution map of *Echinopsis schickendantzii* F.A.C.Weber.

a character that is already variable in the species. It differs from the Bolivian *E. volliana* (Backeb.) Friedrich & G.D.Rowley in its longer flowers (12–15 cm in *E. volliana*).

Echinopsis schickendantzii is from Argentina (Hunt, 2006). The plant known as *E. spachiana* was said to have originated in western Argentina (Anderson, 2001) but Hunt *et al.* (2006) regard it as of 'uncertain' origin. Hunt *et al.* (2006) listed the name *E. spachiana* under the heading 'Names whose original application is indeterminate or debatable'. They regarded it as untypifiable, as no type material had been preserved, and treated it as a name 'best abandoned'. The type locality was simply given as 'Mexico', which is either a mistake or based on a cultivated plant.

Echinopsis schickendantzii is grown for ornamental purposes and as a hedge plant (Henderson, 2001) and the impressive mass display of its large white flowers (Fig. 142), all opening at the same time, makes it a very attractive and popular garden ornamental. Hunt (1989, 2006) points out the suitability of *Echinopsis schickendantzii*, *E. spachiana* and *E. volliana* for use as grafting stocks.

In South Africa it is a potential habitat transformer and a declared weed that is often encountered in dry savanna and karoo (Henderson, 2001, 2007). This species has been increasing in abundance over the last decade or two (Henderson, 2010). The white fruit pulp (Fig. 143) is eagerly consumed by birds, resulting in seedlings establishing under any suitable perch and even on roofs. Its spread could take on similar proportions to those of *Opuntia ficus-indica* in the early twentieth century, unless urgent action is taken to control its spread (Henderson, 2010).



Fig. 140. The pericarpels of *Echinopsis schickendantzii* F.A.C.Weber are obscured by blackish hairs. (Picture by Gideon F. Smith)



Fig. 141. *Echinopsis schickendantzii* F.A.C.Weber. (Picture by Neil R. Crouch)



Fig. 142. Flowers of *Echinopsis schickendantzii* F.A.C.Weber. (Picture by Neil R. Crouch)



Fig. 143. Fruit of *Echinopsis schickendantzii* F.A.C.Weber. (Picture by Lesley Henderson)

***Harrisia* Britton**

Mostly shrubs, sometimes scandent or tree-like, up to 7 m tall; branches usually slender, ribbed, not segmented, not rooting aerially; ribs 3–5(–12). **Flowers** nocturnal, funnellform, 12–22 cm long; hypanthium elongate; perianth 8–17 cm broad, white; pericarpel areoles with hair-spines or merely felted. **Fruit** fleshy, areolate and scaly and/or spiny, yellow or orange and not splitting (subg. *Harrisia*), or red and usually splitting (subg. *Eriocereus*). **Seed** broadly ovoid, 1.5–4.0 × 1.2–1.8 mm, black-brown, semi-matt, periphery crested with larger cells, relief low-domed; hilum-micropylar region of medium size, basal, deeply impressed, forming a chamber.

References: Obermeyer (1976), Parfitt (2003), Hunt *et al.* (2006).

A member of the tribe Trichocereae, *Harrisia* has a disjunct natural occurrence in tropical America, with one or two species in subgenus *Harrisia* from Florida and across the Caribbean islands, and six or seven species in subgenus *Eriocereus* from South America in Brazil, Paraguay, Bolivia and Argentina (Anderson, 2001; Hunt, 2006).

The two species in South Africa are both in subgenus *Eriocereus*, and have long, flexible, narrow branches with areoles relatively far apart. The areoles lack glochidia. Pericarpel and hypanthium scales are numerous and relatively dense to overlapping, with hairy to villous axils.

Key to the two species of *Harrisia* naturalised in southern Africa:

- 1. Central spine 2.5–3 cm long; peripheral spines 1–2 cm long. Flowers 5–10 cm wide; pericarpel and hypanthium scales c. 2 cm long. Fruit up to 7 cm in diameter, with conspicuous scales with axillary villous hairs **1. *Harrisia balansae***
- 1'. Central spine 2–3 (–4) cm long; peripheral spines 1–3 mm long. Flowers 15–17 cm wide; pericarpel and hypanthium scales 2–3 mm long. Fruit c. 3 cm in diameter, scales not conspicuous **2. *Harrisia martinii***

1. *Harrisia balansae* (K.Schum.) N.P.Taylor & Zappi

In: *Cactaceae Consensus Initiatives* 3: 7 (1997).

Clambering shrub, 1–4 m, but reputedly up to 25 m tall; trunk up to 8 cm in diameter; branches segmented, obtusely 3–4(–5)-angled, 3–4(–5) cm in diameter. Spines c. 6, 1 stouter and longer (2.5–3 cm long) than the rest (1–2 cm long). **Flowers** large, 15–20 × 5–10 cm; pericarpel and hypanthium scales c. 2 cm long, without spines, numerous and relatively dense to overlapping on the hypanthium, with hairy to villous axils; flowering areole nearly naked. **Fruit** 4–7 cm in diameter, strongly tuberculate, each tubercle topped by a persistent scale, axils villous-hairy. **Seed** large (c. 2.5 mm long), rugose, black-brown (virtually black). **Distribution:** SA. (Fig. 144)

Reference: Kiesling (1996).

This account follows Hunt *et al.* (2006), who rejected the name *Harrisia bonplandii*, (Pfeiff.) Britton & Rose, considering it a source of confusion as it could not be satisfactorily typified, despite a thorough analysis by Leuenberger (2001).

This plant has previously been misidentified as *Acanthocereus tetragonus* (L.) Hummelinck of the tribe *Pachycereeae*, which has smaller hypanthium scales that are set further apart (fewer), the axils of which are felted and sometimes spiny, though not hairy. It also has branches sharply 3–5(–7)-winged or -angled, pericarpel scale axils that are usually spiny, and a stout, rigid, markedly flared hypanthium.



Fig. 144. Distribution map of *Harrisia balansae* (K.Schum.) N.P.Taylor & Zappi.

In contrast, *Harrisia balansae* has a relatively slender hypanthium, with numerous scales (relatively dense) the axils of which are villous-hairy and without spines (Fig. 145). Its branches rarely have as many as 5 obtuse ribs or angles (Fig. 146), and its pericarpel scale axils are also villous-hairy, without spines.

It can further be confused with *Hylocereus triangularis* (L.) Britton & Rose, with spines only up to 7 mm long borne on crenations, and it bears a superficial resemblance to *H. undatus*, which has branches with much thinner, acute, horn-rimmed wings that are broadly crenate between areoles.

Harrisia balansae is native to Bolivia and Paraguay and adjoining parts of Brazil (Mato Grosso do Sul) and Argentina (Gran Chaco) (Anderson, 2001). In South Africa it has been recorded in two localities: one in North-West Province near Groot Marico (Fig. 147), and a doubtful record of a few plants near Rust de Winter, Limpopo Province. This is an emerging invader and could be subject to a rapid eradication response programme in view of its potential risk and limited distribution.

Harrisia balansae is susceptible to infection by the mealybug *Hypogeococcus pungens* (Fig. 148). However, further observations are needed to verify if additional control measures are required, since infested plants produce fruits that are eagerly consumed by frugivorous birds. The seeds of infested plants are therefore still dispersed.



Fig. 145. Fruit of *Harrisia balansae* (K.Schum.) N.P.Taylor & Zappi. (Picture by Helmut G. Zimmermann)



Fig. 146. Branches of *Harrisia balansae* (K.Schum.) N.P.Taylor & Zappi are rarely up to 5-ribbed. (Picture by Helmuth G. Zimmermann)



Fig. 147. *Harrisia balansae* (K.Schum.) N.P.Taylor & Zappi in Groot Marico. (Picture by Helmuth G. Zimmermann)



Fig. 148. *Harrisia balansae* (K.Schum.) N.P.Taylor & Zappi damaged by mealy bug infection. (Picture by Helmuth G. Zimmermann)

2. *Harrisia martinii* (Labour.) Britton

In: *Addisonia* 2: 55, pl. 68 (1917).

=*Eriocereus martinii* (Labour.) Riccob.

Common names: harrisia cactus, Martin's harrisia, moon cactus (in Australia) (English); toukaktus (Afrikaans).

Sprawling or clambering shrub, capable of resprouting from an underground rootstock, c. 0.8(–2) m tall; stems much-branched, often arching; branches dark green, (1.5–)2–2.5(–4) cm in diameter, not rooting aurally; ribs 4–5, low, lending the stems an appearance of plaited rope; areoles seated on broad tubercle, 1.5–2.5(–3.5) cm apart. Central spine 1(–2), 2–3(–4) cm long; peripheral spines 1–3(–7), up to 3 mm long. **Flowers** nocturnal, from Nov. to Mar., 15–22 × 15–17 cm; scales broadly triangular-subulate, 2–3 mm long; pericarpel areoles felted and more or less hairy; outer tepals narrow, greenish white; inner tepals white or pale pink. **Fruit** from Dec. to May, globose, c. 3 cm in diameter, tuberculate and very shortly spiny, red, splitting down one side; pulp white. **Seed** black-brown (virtually black). **Distribution:** N, SA. (Fig. 149)

References: Obermeyer (1976), Zimmerman (1983), Telford (1984), Kiesling (1996), Henderson (2001), Hunt *et al.* (2006).

Harrisia martinii (Fig. 150, 151) originates from the Gran Chaco region of Paraguay and Argentina (Anderson, 2001; Hunt, 2006), probably in seasonally arid savanna habitats similar to the invaded habitats in South Africa. In Argentina it occurs in Chaco, Corrientes, Entre Ríos, Formosa and Santa Fé provinces (Kiesling, 1996; Hunt, 2006).

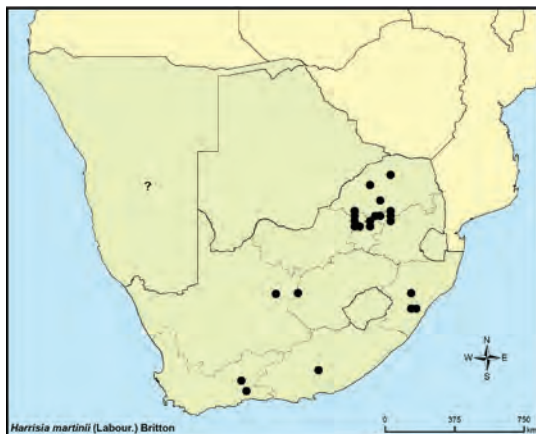


Fig. 149. Distribution map of *Harrisia martinii* (Labour.) Britton.



Fig. 150. Flower of *Harrisia martinii* (Labour.) Britton. (Picture by Pieter J.D. Winter)



Fig. 151. Fruit of *Harrisia martinii* (Labour.) Britton. (Picture by Pieter J.D. Winter)

The harrisia cactus was a serious invader in Australia (Fig. 152) and parts of South Africa (KwaZulu-Natal, Limpopo, Northern Cape and North-West Province) (SAPIA data). It is sporadically naturalised across the savanna biome of South Africa (Henderson, 2001, 2007) and is a declared weed (Henderson, 2001) (category 1), due to the transformation of woodland. Chemical control is difficult because of the underground tubers which are hard to reach. South Africa profited from a successful biological control programme in Australia in the late seventies. The two natural enemies, originally from Argentina, were eventually also introduced to South Africa where they also provide good control. They are the mealybug, *Hypogeococcus pungens*, released in 1983, and the long-horn stemborer, *Alcidion cereicola*, released in 1990 (Klein, 1999).



Fig. 152. *Harrisia martinii* (Labour.) Britton was an invader in Australia.
(Picture by Stefan Nesar)

***Hylocereus* (A.Berger) Britton & Rose**

Climbers or scramblers, often epiphytic or epilithic (lithophytic); often much more than 5 m high; branches usually 3-winged or angled, segmented, green or glaucous, the margins often horny, producing aerial roots. Spines short or rarely absent. **Flowers** usually very large, funnellform, nocturnal, white or rarely red; pericarpel and hypanthium stout; scales typically broad, triangular, sometimes small or rudimentary; pericarpel areoles naked or spiny. **Stamens** numerous in a continuous series. **Style** thick; stigma lobes sometimes bifid. **Fruit** large, globose, ovoid or oblong, fleshy, with broad scales. **Seed** ovoid or broadly ovoid, c. 2.5 × 1.5–2 mm, black-brown, smooth; hilum-micropylar region of medium size, oblique, superficial; mucilage sheath present, covering entire seed.

References: Parfitt (2003), Taylor & Zappi (2004), Hunt *et al.* (2006), N.P. Taylor, (*pers. comm.*).

As currently circumscribed, *Hylocereus* comprises 14 species from tropical America, only one of which has become naturalised in southern Africa. They climb or scramble high into trees or over lower vegetation, aided by climbing aerial roots that often form dense mats around a supporting tree trunk. The branch segment wings are acute and usually spineless or with short spines less than 7 mm long, whereas branch segments of *Harrisia* are obtuse or rounded in transverse section and have spines more than 1 cm long. The nocturnal flowers are amongst the largest in the family (N.P. Taylor, *pers. comm.*).

***Hylocereus undatus* (Haw.) Britton & Rose**

In: Britton, *Flora of Bermuda*: 256 (1918).

Common names: belle of the night, conderella plant, dragon fruit, night blooming cereus, red pitahaya, strawberry pear (English).

Climber 4–10 m high (sometimes epiphytic or epilithic): branches usually segmented, 3-ribbed, 4–7.5 cm in diameter, producing aerial roots; ribs compressed, thin, acute, margin crenate; areoles in the notches between teeth, usually 4–5 cm apart. Central spine absent or present, conical, 3–6 mm long, grey-brown; peripheral spines 0–2, 2–4 mm long. **Flowers** 25–30 × 15–25 cm; scales broad, imbricate; outer tepals lorate to linear, reflexed, bases greenish or yellowish, apices acuminate, red; inner tepals spatulate, up to 14 cm long, apices acute, fimbriate, white. **Stamens** of mature flower roughly parallel to perianth. **Style** cream; stigma lobes c. 24. **Fruit** globose-oblong, 10–15 × 10–12 cm, red; fruit scales long-pointed, up to 2.5 cm long, fleshy; pulp white. **Seed** black-brown (virtually black), shiny. **Distribution:** SA. (Fig. 153)

References: Anderson (2001), Parfitt (2003), Taylor & Zappi (2004), Hunt *et al.* (2006).

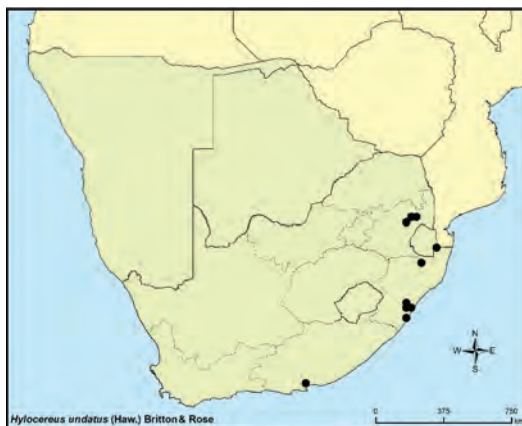


Fig. 153. Distribution map of *Hylocereus undatus* (Haw.) Britton & Rose.

This species may be confused with *Harrisia balansae*, which also has 3-ribbed branches. *H. balansae* differs in its lower, rounded ribs. *Hylocereus triangularis* differs by its angles not horn-rimmed, and the areoles borne on the crenations rather than in the sinuses between crenations. Its flowers are shorter (14–25 cm long), and the fruit is also smaller (7–10 × 3–5 cm) (Hunt, 2006).

Hylocereus undatus is probably native in tropical America, perhaps Mexico and Central America (Taylor & Zappi, 2004). Originally introduced to South Africa as an ornamental because of its spectacular, large, white, nocturnal flowers (Fig. 154), *Hylocereus undatus* and related species are becoming important commercial fruit plants in many countries, particularly in the tropics. The fruit is known as dragon fruit (a name also applied to fruit of *Hylocereus triangularis* (L.) Britton & Rose as produced in SE Asia — N.P. Taylor, *pers. comm.*) and is very attractive, with its red colour, large size and white pulp (Fig. 155). Dragon fruit (Fig. 156) is now becoming available in fresh produce markets in South Africa.

Hylocereus undatus is recorded as invasive in mesic, low-lying areas of KwaZulu-Natal (Fig. 157), Mpumalanga (Fig. 158) and Eastern Cape. Elsewhere individual plants persist where planted, but do not seem to reproduce. Infestations are still small and localised, originating mainly from homestead gardens from where they have escaped. The plant spreads by cuttings or vegetative parts that root to form new plants and with the aid of birds that spread the seeds. Control is not difficult. It is currently not a declared invader in South Africa, but should be proposed to be listed as a category 2 invader under NEMBA and CARA, as it has valuable commercial potential (L. Henderson, *pers. comm.*).



Fig. 154. Flower of *Hylocereus undatus* (Haw.) Britton & Rose.
(Picture by Geoff R. Nichols)



Fig. 155. Fruit of *Hylocereus undatus* (Haw.) Britton & Rose.
(Picture by Geoff R. Nichols)



Fig. 156. Fruit of *Hylocereus undatus* (Haw.) Britton & Rose (dragon fruit) is commercially traded. (Picture by Helmuth G. Zimmermann)



Fig. 157. *Hylocereus undatus* (Haw.) Britton & Rose is invasive in KwaZulu-Natal.
(Picture by Geoff R. Nichols)



Fig. 158. *Hylocereus undatus* (Haw.) Britton & Rose is invasive in Mpumalanga.
(Picture by Lesley Henderson)

***Myrtillocactus* Console**

Arborescent or shrubby; branches numerous, stout, ascending, few-ribbed, spiny. **Flowers** diurnal, up to 9 at each areole, small; scales small; hypanthium very short; perianth rotate; pericarpel areoles slightly woolly. **Stamens** relatively few. **Fruit** globose, small, fleshy, purple. **Seeds** broadly ovoid, 1.6 × 1.3 mm, black-brown, dull, relief low-domed; hilum-micropylar region of large size, basal, impressed.

References: Anderson (2001), Hunt *et al.* (2006).

This small genus is endemic to Guatemala and Mexico. It comprises four species that appear to be quite closely related (Hunt, 2006). It is unusual in its small flowers with few tepals that are borne in fascicles. The branches bear a slight resemblance to those of naturalised *Cereus* species, as well as to *Euphorbia ingens* E.Mey. ex Boiss., but the ribs are fewer, not as prominent, and wider at the base, and the spines are generally shorter and stouter.

***Myrtillocactus geometrizans* (Pfeiff.) Console**

In: *Bollettino delle Reale Orto Botanico di Palermo* 1: 10 (1897).

Common names: bilberry cactus, whortleberry cactus (English); rosyntjiekaktus (Afrikaans).

Shrub or tree up to 4–5 m; trunk short; branches numerous, upcurving, 6–10 cm in diameter, blue-green; ribs 5–6, smooth, low, rounded; areoles 5–30 mm apart. Central spine 1, 1–7 cm long, dagger-like and sometimes 6 mm broad at the base, almost black; radial spines 5–9, 2–10 mm long, red-brown to blackish at first, fading to grey. **Flowers** c. 2 × 2.5–3.5 cm, creamy or greenish white. **Fruit** globose, spineless, 1–2 cm in diameter, dark red or purple, very tasty. **Distribution:** N, SA. (Fig. 159)

References: Anderson (2001), Hunt *et al.* (2006).

This species occurs in Guatemala and throughout the central and northern central parts of Mexico (Anderson, 2001; Hunt, 2006). In South Africa it has been recorded near Groot Marico (North-West Province) (Fig. 160) and in the Addo Elephant National Park (Eastern Cape Province).



Fig. 159. Distribution map of *Myrtillocactus geometrizans* (Pfeiff.) Console.



Fig. 160. *Myrtillocactus geometrizans* (Pfeiff.) Console. (Picture by Helmuth G. Zimmermann)

The botanical and English vernacular names allude to the resemblance of fruit (Fig. 161) to that of true myrtle, *Myrtus communis* L. (Anderson, 2001), or of billberry or whortleberry, *Vaccinium myrtillus* L. The fruit is widely eaten in Mexico, both fresh and dried like raisins, and is known as 'garambullo' (Anderson, 2001). The Afrikaans common name indeed translates as 'raisin cactus'.

Originally introduced as an ornamental, it is very easily confused with small *Euphorbia ingens* plants, also sharing the same habitat with this species. It can be distinguished from *E. ingens* by the absence of milky latex and cyathia (flower shown in Fig. 162), and the presence of an areole with a stout central spine and some radial spines as opposed to a spine shield with or without a pair of spines. Although its fruit is delicious, it is not widely consumed by humans in South Africa.



Fig. 161. Fruit of *Myrtillocactus geometrizans* (Pfeiff.) Console.
(Picture by Gideon F. Smith)



Fig. 162. Flower of *Myrtillocactus geometrizans* (Pfeiff.) Console.
(Picture by Gideon F. Smith)

***Opuntia* Mill.**

Shrubs or trees with segmented branches; branch segments usually flattened above (cladodes), sometimes cylindrical, rarely somewhat tuberculate, often glaucous, sometimes tomentose. **Leaves** usually very small, subulate, caducous; glochidia present. Spines acicular, subulate or bristly, not sheathed. **Flowers** usually on the edges of the branch segments, diurnal. **Pericarpel** with leaves, areoles, glochidia and often spines, often produced into a short hypanthium beyond the ovary. **Perianth** rotate or spreading, rarely erect, yellow, pink, red or off-white. **Stamens** touch-sensitive. **Style** often more or less expanded near base. **Fruit** fleshy or dry. **Seed** compressed, orbicular to broadly ovate in outline, 3–9 mm long; funicular envelope ('aril') brown to off-white, surface bony.

References: Anderson (2001), Parfitt & Gibson (2003), Hunt *et al.* (2006), N.P. Taylor (*pers. comm.*).

Most *Opuntia* species are readily recognised by their compressed branches, i.e. they are modified to cladodes (at least the terminal ones). In *O. salmiana*, some or all branch segments are cylindrical, but then narrower than those of *Austrocylindropuntia* or *Cylindropuntia*, only up to 1 cm in diameter, and with softer spines or bristles. Flowers of species in southern Africa are yellow to orange (off-white or cream in *O. salmiana*).

There are 75 species of *Opuntia* currently recognised in North and South America and the West Indies (Hunt, 2006). Twelve species are naturalised in southern Africa (four from South America, eight from Mexico, USA or the West Indies). Several of these are often widespread in southern Africa and cause serious infestations and transformation of vegetation.

Key to the species of *Opuntia* naturalised in southern Africa [based partly on Obermeyer (1976)]:

1. At least some stem segments slender, cylindrical or semi-cylindrical, up to 2.5 cm wide **2**
- 1'. All stem segments flattened (cladodes), more than 3 cm wide **3**
2. Terminal stem segments (cladodes) slightly flattened; spines sturdy, rigid; flowers deep yellow; fruit purplish, red or green, 3–4 cm wide **1. *Opuntia aurantiaca***
- 2'. Terminal stem segments mostly cylindrical (not flattened); spines bristle-like; flowers pale yellow to almost white; fruit bright red, c. 1 cm wide **10. *Opuntia salmiana***
3. Cladode surface minutely velvety, hairs clearly visible with a 10x lens . **4**
- 3'. Cladode surface smooth (or minutely papillose in *O. spinulifera*, papillae not visible with a 10x lens) **5**
4. Areoles not prominent, in addition to glochidia, bearing many pale yellow spines and flexible white bristles becoming longer (up to 75 mm) and appearing more dense on older segments, sebaceous or filiform, white, almost covering the stem, particularly in young plants **6. *Opuntia leucotricha***

- 4'. Areoles prominent, bearing numerous glochidia but without spines (rarely one), long white bristles absent **7. *Opuntia microdasys***
5. Cladodes orbicular (not more than 1.5x as long as broad) **6**
- 5'. Cladodes obovate or elliptic, attenuate towards the base (usually more than 1.5x longer than broad) **8**
6. Cladodes up to 2 cm thick; spines less than 1 mm thick, c. 1.5 cm long, in sunken areoles less than 2 cm apart; fruit yellowish with pale pulp **11. *Opuntia spinulifera***
- 6'. Cladodes 1.5–4 cm thick; spines absent or more than 1 mm thick, more than 2 cm long, in sunken or slightly raised areoles more than 2 cm apart; fruit red to purple with similarly coloured pulp **7**
7. Arborescent, (1.5–)3(–5) m tall; cladodes up to 40 cm in diameter; areoles somewhat sunken; glochidia few or inconspicuous; fruit broadly obovoid to globoid, 7–8 cm long and as wide, long-tuberculate (at least while green) **9. *Opuntia robusta***
- 7'. Shrub with branches close to the ground, 0.4–1.5 m tall; cladodes less than 25 cm in diameter; areoles somewhat raised; glochidia unusually large, prominent in areoles of upper half of cladode, particularly along the distal margin; fruit obovoid or ellipsoid, c. 7 cm long and c. half as wide, smooth . . **3. *Opuntia engelmannii***
8. Cladodes glaucous, dull; pericarpel scales and outer tepals green or yellowish, at most with a reddish tinge **9**
- 8'. Cladodes not glaucous, green, often shiny or tinged purple; pericarpel scales and outer tepals uniformly red **12**
9. Procumbent shrublets up to 0.3 m high; fruit narrowly obovoid, less than 3 cm wide **5. *Opuntia humifusa***
- 9'. Shrubs or trees; fruit wider than 30 cm **10**
10. Tall shrubs or trees 1.8–3(–5) m tall; cladodes 20–60 cm long; pericarpel with many areoles; fruit ellipsoid or obovoid, greenish to orange or red, with pale pulp **4. *Opuntia ficus-indica***
- 10'. Low spreading bushes 1–1.6(–2) m tall; cladodes 10–20 cm long; pericarpel with few or no areoles; fruit obovoid or pyriform, narrowed at the base, smooth, red-purple with deep red-purple pulp **11**
- 11'. Areoles less than 8 mm across, with few (0–3), thinner, yellow to greyish spines, mostly along the cladode margin; glochidia inconspicuous; pericarpel and fruit usually straight **13. *Opuntia stricta* var. *stricta***
11. Areoles more than 8 mm across, with 4–7(–11) coarse, hard, yellow to brown spines, not concentrated along cladode margin; glochidia conspicuous; pericarpel and fruit often curved **12. *Opuntia stricta* var. *dillenii***
12. Cladodes less than 4x as wide as thick; tubercles not apparent; cladode margin straight or convex between areoles; inner tepals bright orange **2. *Opuntia elata* var. *elata***
- 12'. Cladodes more than 8x as wide as thick; tubercles prominent, cladode margin concave between some tubercles/areoles; inner tepals yellow **8. *Opuntia monacantha***

1. *Opuntia aurantiaca* Lindl.

In: *Botanical Register* 19: t. 1606 (1833).

Common names: jointed cactus, tiger pear (English); katjie, litjieskaktus, suurtjie (Afrikaans).

Low spreading spiny shrub up to 0.3(–1) m high; subterranean parts developed into tubers; lower (older) branch segments almost cylindrical, upper segments (cladodes) somewhat compressed, 6–15(–20) × 1.5(–2.5) × 1 cm, not tuberculate, easily detached, bright green, sometimes tinged reddish-purple. Spines usually 2–3 per areole, sturdy, rigid, 1–3 cm long, pale brown, barbed. **Flowers** from Nov. to Jan., 2.5–4 cm across, deep yellow. **Fruit** up to 3 cm long, purple-red or green and seedless, with few spines (upper pericarpel areoles may generate further fruit, thus forming short chains); detached fruit may regenerate vegetatively through the formation of roots and shoots. **Distribution:** S, SA. (Fig. 163)

References: Moran *et al.* (1976), Obermeyer (1976), Zimmerman (1983), Anderson (2001), Henderson (2001), Hunt *et al.* (2006).

The epithet '*aurantiaca*' is a misnomer, as this species never has orange flowers (Moran *et al.*, 1977). It is usually identified by its narrow, slightly flattened, rigidly spiny stems, of which the terminal segments are somewhat flattened and easily detached (Fig. 164). The name 'tiger pear' (used in Australia) presumably alludes to the common stem colouring, green with darker purplish areas on the edges, and around, but particularly extending in a stripe below, each areole.

Jointed cactus is originally from central and eastern Argentina and Uruguay in South America (Zimmermann, 1983). Hunt *et al.* (2006) tentatively grouped it with *Opuntia salmiana* from southeastern South America, in their informal '*Aurantiacae*' group, but noted that it resembles taxa in his more widespread '*Curassavicae* & *Pumilae*' group.



Fig. 163. Distribution map of *Opuntia aurantiaca* Lindl.

In South Africa the species (Fig. 165) is found in dry parts of the savanna biome (Henderson, 2007) from Limpopo Province to the far eastern part of the Northern Cape, as far east as Swaziland, and south to the Eastern Cape. Some outlying infestations have been recorded from Namaqualand (SAPIA data). It is classified as a category 1 invader (Henderson, 2001) and has been proposed for listing as a category 1b species under NEMBA and CARA (Anonymous, 2009). It is also naturalised in Australia (Telford, 1984). *Opuntia aurantiaca* spreads vegetatively by means of easily detached small branch segments or fruit that attach to animals, vehicles and farm equipment by needle-sharp, barbed spines (Fig. 166). Both branch segments and fruit have the capacity to root and give rise to plantlets from their areoles (Zimmermann, 1983). This was the most expensive and damaging cactus invader in South Africa for many years. It was introduced from Argentina via England by 1856. It is a declared weed, as it transformed pastoral land with karroid, savanna, and thicket vegetation, rendering it virtually useless especially for small stock farming (Zimmermann, 1983). Millions of rands were spent on its chemical and mechanical control between 1957 and 1999.



Fig. 164. *Opuntia aurantiaca* Lindl. has flattened terminal stem segments.
(Picture by Neil R. Crouch)



Fig. 165. *Opuntia aurantiaca* Lindl. Note sterile fallen fruit propagules.
(Picture by Neil R. Crouch)

The introduction of the cochineal insect, *Dactylopius austrinus*, in 1932 contributed substantially to its biological control, but its efficacy was not acknowledged and chemical control persisted until a few years ago. Research on the host plant-insect interaction contributed to a better understanding of biological control so that chemical control is now largely replaced by biological control (Fig. 167). The cochineal performs best in warm, dry regions.

Herbicidal control is still practiced in sensitive areas and where the cochineal performs poorly. For registered herbicides consult the Department of Agriculture's guide to the use of herbicides (Anonymous, 2004; Grobler, 2005).



Fig. 166. Easily detached stem segments of *Opuntia aurantiaca* Lindl. attach to humans and animals. (Picture by Helmuth G. Zimmermann)



Fig. 167. Biological control of *Opuntia aurantiaca* Lindl. by means of its own cochineal (*Dactylopius austrinus*) and a caterpillar. (Picture by Helmuth G. Zimmermann)

2. *Opuntia elata* Salm-Dyck

In: *Hortus Dyckensis* ou *Catalogue des Plantes*: 361 (1834) **var. elata**

Shrub 1–1.5 m tall; cladodes oblong-elliptic or narrowly obovate, up to 25 cm long and usually more than 2 cm thick, green, often with purple blotches, along the cladode margin and around areoles, particularly below them; areoles sparse, wool white; glochidia virtually absent, not prominent. Spines 0–3, unequal, 2–3.5(–6) cm. **Leaves**, scales and sepaloid tepals crimson-red, caducous. **Flowers** c. 5 cm across, orange. **Stamens** whitish. **Stigma** whitish. **Fruit** obovate to oblong, 6 cm long, spineless; pulp pale. **Seed** 6 mm long, fertile. **Distribution**: N, SA. (Fig. 168)

References: Telford (1984), Anderson (2001), Leuenberger (2002), Hunt *et al.* (2006).



Fig. 168. Distribution map of *Opuntia elata* Salm-Dyck var. *elata*.

Opuntia elata belongs with *O. monacantha* in series *Armatae*. It is readily distinguished from that species by its shorter, thicker (more than 2 cm) cladodes (Fig. 169) and orange, not yellow, inner tepals (Fig. 170) (Leuenberger, 2002). The South American species tend to have stem colouring in various shades of green, though not glaucous or greyish as in most species from further north.

The natural distribution range of *Opuntia elata* is centred on the Entre Rios region of southeastern South America, along the mid to lower reaches of the Paraná and Uruguay rivers, and includes parts of Paraguay, Argentina (Corrientes, Entre Ríos, Santa Fé), Brazil (Rio Grande do Sul) and Uruguay. In South Africa, it has been present as an ornamental for at least fifty years, but has only recently (in 2008) been recorded as an emerging invasive plant in the Western Cape Province (Leeugamka and Beaufort West) (Fig. 171, 172). It is also known to be naturalised in the Coega area near Port Elizabeth (Eastern Cape), and in Namibia. The dry conditions in which most invading populations are found in southern Africa are surprising considering its origin from an area with over 1 000 mm annual precipitation, though this is explained by their native occurrence on rock outcrops (N.P. Taylor, *pers. comm.*). The species is also naturalised in Australia (Telford, 1984).

This species is not yet a declared invader in South Africa. The eastern seaboard may be most vulnerable to invasion, given the similarity to its native conditions, and the naturalised range of its closest relative in South Africa, *O. monacantha*, should be used as a guideline. It is not known whether it is susceptible to *Dactylopius ceylonicus*, like some of its close relatives from South America.



Fig. 169. *Opuntia elata* Salm-Dyck var. *elata* has short thick cladodes.
(Picture by Helmuth G. Zimmermann)



Fig. 170. Flower of *Opuntia elata* Salm-Dyck var. *elata*. (Picture by Pieter J.D. Winter)



Fig. 171. *Opuntia elata* Salm-Dyck var. *elata*. (Picture by Pieter J.D. Winter)



Fig. 172. *Opuntia elata* Salm-Dyck var. *elata* is a common ornamental plant.
(Picture by Pieter J.D. Winter)

3. *Opuntia engelmannii* Salm-Dyck

In: *Cacteeae in Horto Dyckensi Cultae*. Anno 1849: 235–236 (1850).

=*Opuntia engelmannii* Salm-Dyck var. *lindheimeri* (Engelm.) B.D.Parfitt & Pinkava

=*Opuntia lindheimeri* Engelm.

=*Opuntia tardospina* Griffiths (sometimes spelled 'tardispina')

Common names: small round-leaved prickly pear (English); kleinrondeblaarturksvy (Afrikaans).

Shrub, ± erect to decumbent, 0.8–1.5 × 1–5 m; trunk usually absent; cladodes orbicular or broadly obovate, 15–20 × 12–20 cm, more or less tuberculate, glabrous, often glaucous; areoles elliptic, 4.5 × 3 mm, 5–8 in a row diagonally across the centre of the cladode, 2.5–4 cm apart, wool tawny, ageing blackish; glochidia yellow, becoming brown. Spines 1–3(–6), sometimes absent from lower areoles, subulate, slightly flattened, most curved and thus lying near the stem surface, up to 4(–5) cm long, yellow or paler, becoming brown or grey with age.

Leaves 3–9 mm long. **Flowers** from Oct. to Dec., 5–8 × 5–7.5(–10.5) cm, yellow, rarely red. **Fruit** obovoid to very broadly obovoid, almost spineless, 3–7 cm, purple or red; pulp reddish purple (not green in southern Africa). **Seeds** subcircular to deltoid, flat, 2.5–6 × 2–5 mm wide, tan to grayish; girdle protruding 0.3–0.5 mm.

Distribution: N, SA. (Fig. 173)

References: Obermeyer (1976), Anderson (2001), Henderson (2001), Parfitt & Gibson (2003), Hunt *et al.* (2006).

Not only is *Opuntia engelmannii* very variable (Fig. 174, 175), it also hybridises with *O. stricta*, *O. phaeacantha* Engelm. and *O. littoralis* (Engelm.) Cockerell in the USA (Pinkava, 2003a), thus creating blurred species boundaries. In cultivation it may hybridise more widely, particularly within series *Phaeacanthae*, and such hybrids may become invasive. Some variants that have previously been formally recognised as *O. tardospina* and *O. lindheimeri* occur in South Africa, mainly in the Eastern Cape Province.



Fig. 173. Distribution map of *Opuntia engelmannii* Salm-Dyck. More invasions in the Gariep - and Vaal River basins are suspected.



Fig. 174. Flower of *Opuntia engelmannii* Salm-Dyck. (Picture by Pieter J.D. Winter)



Fig. 175. Fruit of *Opuntia engelmannii* Salm-Dyck. (Picture by Pieter J.D. Winter)

Future identifications in South Africa should also consider the probability of other members of series *Phaeacanthae* having become naturalised. Other names from this Mexico-USA centred group previously used in southern Africa include *O. ×occidentalis* Engelm. & J.M. Bigelow (a complex involving *O. engelmannii*, *O. littoralis* and *O. phaeacantha*), *O. macrocentra* Engelm. (including the synonym *O. violacea* Engelm. ex B.D. Jacks.) and *O. phaeacantha* var. *major* Engelm.

Opuntia engelmannii occurs in Mexico from Chihuahua east to Tamaulipas and as far south as Hidalgo. In the USA it has a range from California to Texas, and as far north as the southern parts of Nevada and Utah. It has a wide altitudinal range from 100 m to 2 700 m above sea level (Pinkava, 2003a). It is naturalised in Australia (Telford, 1984).

Although this species is widely used in Texas as a source of fodder for stock and wildlife (spines and glochids are singed with flame throwers to make them edible), this is not the case in southern Africa, and is not considered to be a sustainable practice. It was presumably introduced into southern Africa as an ornamental.

Infestations are known from along the lower reaches of the Vaal River in North-West Province (Bloemhof area), Free State (Vredefort Dome, Brandfort and Kroonstad areas to Bloemfontein) (Fig. 176, 177), and in the Northern Cape (Douglas and further southwest as far as Strydenburg). In the Western Cape it has been recorded from the Prince Albert and Uniondale districts of the Great Karoo, and in the Eastern Cape from the Willowmore district and between Cradock and Alice in the Fish River basin (SAPIA data). An unidentified population in the Limpopo Province north of Lebogakgomo, where plants have many, long, reddish brown spines and reddish brown glochidia up to 1 cm long, could be a lesser known form, perhaps from Mexico. The species is also naturalised in Namibia.

Hybrids with *Opuntia stricta* (known as *O. ×alta* Griffiths) are suspected in cases (Free State, KwaZulu-Natal) where plants have few or no spines other than on the cladode margin, and fruit with less than 15 areoles (Pinkava, 2003a).

Though a declared weed in South Africa, it was until recently, and at a local scale in the Eastern Cape, considered a minor weed due to biocontrol (Henderson, 2001; L. Henderson, *pers. comm.*), before the plant causing invasions of vast extent in the northern Free State and adjacent areas was identified as the same species. Although the prickly pear cochineal (*Dactylopius opuntiae*) and the cactus moth (*Cactoblastis cactorum*) can damage these plants, the effect is not adequate to keep this species under control, and chemical control is recommended. A more aggressive and host-adapted cochineal biotype may be introduced from the USA in future to improve on biological control.



Fig. 176. *Opuntia engelmannii* Salm-Dyck encroaching onto koppie.
(Picture by Pieter J.D. Winter)



Fig. 177. *Opuntia engelmannii* Salm-Dyck invades grassy-karroid habitat.
(Picture by Helmuth G. Zimmermann)

4. *Opuntia ficus-indica* (L.) Mill.

In: *Gardener's Dictionary*, Edition 8 [unpag.] (1768).

=*Opuntia megacantha* Salm-Dyck

Common names: Indian fig, mission prickly pear, prickly pear, sweet prickly pear (English); boereturksvy, doringturksvy, grootdoringturksvy, turksvy (Afrikaans).

Large shrub or small tree up to 5(–7) m tall, mostly with a trunk up to 1 m in diameter; cladodes obovate to oblong 20–60 × 10–20(–40) × 2.5–5 cm, dull green or blue-green, base attenuate. Spines variable, absent or 1–2 or more, the longer up to 2.5 cm long, white or off-white. **Leaves** caducous. **Flowers** from Oct. to Dec., 6–7 × 5–7 cm, orange or yellow. **Pericarpel** areoles dense, with a few long glochidia (c. 1 cm) in addition to numerous short glochidia. **Fruit** ellipsoid, 5–10 × 4–9 cm, yellow, orange, red or purple in different cultivars. **Seeds** suborbicular, 4–5 mm across, warped, pale tan; girdle only slightly protruding. **Distribution:** B, L, N, S, SA. (Fig. 178)

References: Britton & Rose (1963), Obermeyer (1976), Zimmerman (1983), Anderson (2001), Henderson (2001), Taylor & Zappi (2004), Hunt *et al.* (2006).

This species can be identified by its often narrowly obovate or oblong cladodes (Fig. 179), typically longer than 30 cm, white spines (Fig. 180), orange flowers (Fig. 181) [there are yellow-flowered forms too (Fig. 182), but these are rare in southern Africa], and areolate, ellipsoid fruit with a pale pulp (Fig. 183, 184).

Opuntia ficus-indica is considered to be of hybrid origin and derived from species endemic to the central Mexican Plateau, where it was domesticated and selected for spinelessness and fruit quality (Griffiths, 1909; Pimienta-Barrios, 1990; Nobel, 1994; Griffith, 2004; Reyes-Agüero *et al.*, 2005).

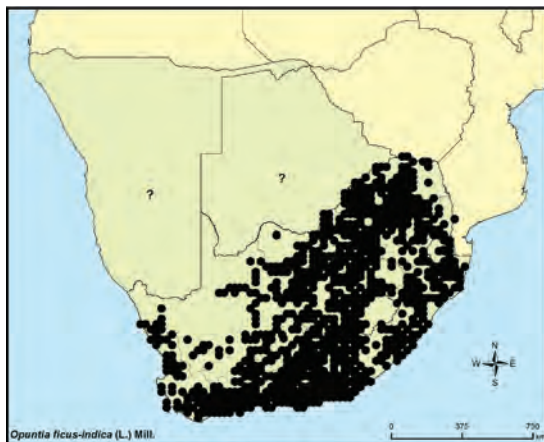


Fig. 178 . Distribution map of *Opuntia ficus-indica* (L.) Mill. These data mostly reflect casual aliens. In South Africa, actual invasions are limited to pockets in the Uitenhage, Ohrigstad and Polokwane areas.



Fig. 179. *Opuntia ficus-indica* (L.) Mill. has oblong cladodes.
(Picture by Helmuth G. Zimmermann)



Fig. 180. White spines of *Opuntia ficus-indica* (L.) Mill. (Picture by Gideon F. Smith)



Fig. 181. Orange flowers of *Opuntia ficus-indica* (L.) Mill. (Picture by Neil R. Crouch)



Fig. 182. Yellow flowers of *Opuntia ficus-indica* (L.) Mill.
(Picture by Neil R. Crouch)



Fig. 183. Unripe fruit of *Opuntia ficus-indica* (L.) Mill.
(Picture by Geoff R. Nichols)



Fig. 184. Reddish fruit on spineless form of *Opuntia ficus-indica* (L.) Mill.
(Picture by Helmuth G. Zimmermann)

Spiny forms have been known under a range of names (Anneck & Moran, 1978) in southern Africa (e.g. *Opuntia elatior* Mill., *O. maxima* Mill., *O. megacantha* Salm-Dyck, *O. schumannii* Weber, *O. tuna* Haw.). While these are mostly misapplied, some, such as *O. elatior*, *O. schumannii* and *O. spinulifera*, represent additional species that were perhaps at one stage naturalised in South Africa, or that still are. The invasive form with orange to red flowers was at one stage referred to as *O. megacantha*.

In the Americas the fruits of these plants are eaten and the juvenile cladodes are consumed as a vegetable. This multi-purpose plant has also been introduced in

various arid and semi-arid countries for use as an emergency source of feed for animals (Felker & Inglese, 2003). In South Africa it is cultivated for edible fruits, animal fodder and is often used as a form of security hedging.

Many spineless cultivars are cultivated in South Africa, but only the spiny form is reported to be invasive. The spineless forms (Fig. 185) are eaten by stock and wildlife. There are a few cases where it appears as if a spineless form is 'invasive' but this is because it grows inside spiny cactus thickets where animals cannot reach it. The plant also undergoes significant genotype-environment interaction which affects identification based on phenotypic traits.



Fig. 185. Spineless form of *Opuntia ficus-indica* (L.) Mill. (Picture by Gideon F. Smith)

The spineless forms were introduced into the rest of the world by Spaniards from Nueva Espana (Mexico) as far back as about 1500. These were soon cultivated all around the European Mediterranean basin. Annecke & Moran (1978) mention that it was introduced into the Cape shortly after Jan van Riebeeck landed. These introductions were still spineless. Once widely established in the Eastern Cape, spiny forms emerged through cross pollination and genetic recombination, reverting back to the spiny forms (seeds taken from a spineless fruit and germinated result in a high proportion of spiny seedlings). The spineless forms were often protected by the spiny forms and could proliferate.

Opuntia ficus-indica invades many habitats, but is mainly a potential transformer in dry and rocky places in savanna, thicket and karoo (Fig. 186), widespread through most of South Africa. During the late 19th century the spiny form invaded huge areas in the Eastern Cape (South Africa) (Fig. 187), Tigray in Ethiopia and in Saudi Arabia. It has never reached full invasive potential in Australia, thanks to early introduction of appropriate biocontrol agents.

Spiny types are declared category 1 (transformers) weeds in South Africa, and have been proposed for category 1b of NEMBA and CARA (Anonymous, 2009). The infestations in South Africa have been successfully controlled to manageable levels using three natural insect predators, namely the cactus moth, *Cactoblastis cactorum*, the cochineal, *Dactylopius opuntiae* (Fig. 188) and the weevil, *Metamasius spinolae* (Annecke & Moran, 1978). Although the use of these biological control agents is the most economical form of control, there are currently also two herbicides registered for use in South Africa (Anonymous, 2004; Grobler, 2005)

Ethiopia has opted to control rampant populations by promoting their utilization as a source of human food (fruit and vegetable), fodder and for the production of the red colourant (carmine) from the cochineal insect *Dactylopius coccus*.

Infestations have now stabilised in South Africa after seventy years of biological control. The biocontrol agents manage to prevent resurgences of prickly pear in previously invaded areas. But some small infestations persist in a few isolated areas e.g. around Uitenhage, Patensie, Grahamstown, Ohrigstad and Polokwane. These are now widely utilised for their fruit and form the basis for an important informal fruit industry. Byproducts made from fruit, including confectionaries, syrups, jams, iqhilika (local brew) and 'nopalitos' are supporting and benefiting many small enterprises, and these are gaining in importance (Beinart, 2007). Control of prickly pear is still practiced in conservation areas and in these cases the preferred and most economical form of control remains biological, though sometimes in combination with chemical control.

In general, *Opuntia ficus-indica* populations have stabilised at acceptable levels and pose no further threat to agriculture and the environment despite the few pockets of infestations in some nature reserves. Its invasive species ranking remains high mainly because of its past history and its wide distribution. The aggression and past impact on agriculture in South Africa still looms high in the memories of farmers and conservationists.



Fig. 186. *Opuntia ficus-indica* (L.) Mill. growing on a cliff ledge. (Picture by Neil R. Crouch)



Fig. 187. Invasion by spiny form of *Opuntia ficus-indica* (L.) Mill.
(Picture by Helmuth G. Zimmermann)



Fig. 188. *Opuntia ficus-indica* (L.) Mill. infected with the cochineal *Dactylopius opuntiae*.
(Picture by Helmuth G. Zimmermann)

5. *Opuntia humifusa* (Raf.) Raf.

In: *Medical Flora* 2: 247 (1830).

Common names: creeping prickly pear, large-flowered prickly pear (English).

Procumbent herb, forming clumps or mats 10-30 cm × 2 m or more; cladodes procumbent, elliptic to obovate or orbicular, 5–12.5 × 4–10 cm, pale green, often tinged purple; areoles with dense glochidia. Spines usually absent, sometimes 1–2, especially on marginal areoles in the upper half of the cladode, up to 2.5 cm long, acicular, not flattened. **Leaves** subulate, 4–7 mm long, caducous. **Flowers** from Oct. to Dec., 4–6 × 4–6 cm, yellow, often with red centre. **Fruit** narrowly clavate or obovoid, purple or red, 2.5–4 × 2–3 cm, fleshy, purple inside. **Seed** fertile. **Distribution:** N, S, SA. (Fig. 189)

References: Britton & Rose (1963), Anderson (2001), Henderson (2001), Partiff & Gibson (2003), Hunt *et al.* (2006).

Opuntia humifusa (Fig. 190, 191, 192, 193) is probably the most widespread of North American *Opuntia* species (Majure, 2010), occurring in Ontario (Canada) and from the Mississippi catchment, throughout the entire eastern part of the USA (Pinkava, 2003a).

In South Africa it occurs throughout the drier western part of the grassland biome (Henderson, 2007), extending from there into more arid areas to the south (Free State, Great Karoo and Camdeboo) and west (southeastern Botswana; Griekwastad; De Aar). It is also naturalised in Namibia and in Australia (Telford, 1984).

This garden escapee has been known to be naturalised since the early 1980s (L. Henderson, *pers. comm.*) and is now spreading rapidly due to bird dispersal of the seeds. It is a declared weed that is a potential transformer of dry grassland, savanna and karoo. It is easily controlled with herbicides (Anonymous, 2004). Except for the cactus moth, which is not a very effective biocontrol agent, there are no other natural enemies that can keep the weed under control.

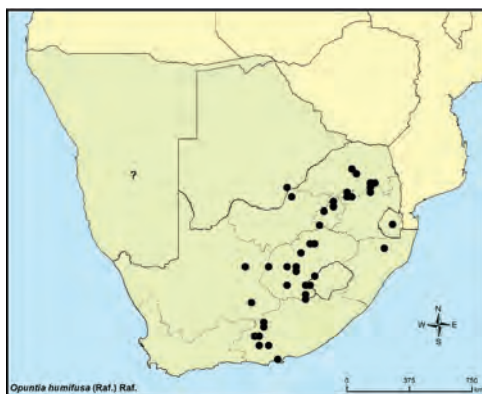


Fig. 189. Distribution map of *Opuntia humifusa* (Raf.) Raf. Gross undersampling is suspected, particularly in the rest of South Africa's Great Karoo.



Fig. 190. *Opuntia humifusa* (Raf.) Raf. (Picture by Neil R. Crouch)



Fig. 191. Flower of *Opuntia humifusa* (Raf.) Raf. (Picture by Neil R. Crouch)



Fig. 192. *Opuntia humifusa* (Raf.) Raf. growing on a rock ledge.
(Picture by Gideon F. Smith)



Fig. 193. Fruit of *Opuntia humifusa* (Raf.) Raf. (Picture by Neil R. Crouch)

6. *Opuntia leucotricha* DC.

In: *Mémoires du Muséum d'Histoire Naturelle* 17: 119 (1828b).

Common names: Aaron's beard prickly pear (English).

Large shrub or small tree 3–4 m tall; cladodes oblong to broadly ovate, up to 25 × 12 cm, c. 1 cm thick, velvety; areoles less than 2 cm apart, spines 1–6, 1–2 cm long, becoming longer (up to 7.5 cm) and appearing more dense on older segments, sebaceous or filiform, white, almost covering the stem, particularly in young plants. **Leaves** small, subulate, aristate, velvety, caducous, red, later green and arista white. **Flowers** c. 5 × 5 cm, yellow. **Fruit** yellowish green, spineless to clothed with long, wispy, filiform spines (particularly during the early stages of development); spines or even complete areoles caducous to varying degrees. **Distribution:** N, SA. (Fig. 194)

References: Britton & Rose (1963), Anderson (2001), Hunt *et al.* (2006), Scheinvar *et al.* (2009).

The shrubby to tree-like *Opuntia leucotricha* (Fig. 195) is characterised by a velvety cladode surface (Fig. 196), combined with the presence of yellow radiate spines (Fig. 197) and a flexuose deflexed white central spine that continues growing to a considerable length (up to 7.5 cm), lending the older cladodes a white bearded appearance (Fig. 198). Flowers are yellow (Fig. 199) sometimes with a orange hue in old flowers, and fruits are yellowish green (Fig. 200).

Opuntia leucotricha in its natural situation is distributed across the Altiplano of central Mexico (Durango, Zacatecas, San Luis Potosí, southern extreme of Nuevo León, western Tamaulipas, northeastern Jalisco, Guanajuato, Querétaro, Hidalgo, Tlaxcala, Puebla) at (839–)1 680–2 100(–2 700) m above sea level (Anderson, 2001; Hunt, 2006; Scheinvar *et al.*, 2009). It is a very popular ornamental plant in Mexico and the USA and is often used by landscape architects. This species was also one of the main exports from a nursery in the Dominican Republic to Miami and possibly served as a vector for the cactus moth, *Cactoblastis cactorum*, to mainland America (Zimmermann *et al.*, 2007).



Fig. 194. Distribution map of *Opuntia leucotricha* DC.

Even though it is not a declared weed in South Africa, it is considered an emerging invasive plant, particularly since it tends to persist where planted or discarded. It has been recorded from the Rust de Winter area, Hammanskraal, Brits area, Pretoria outskirts, Klerksdorp and outskirts of Bloemfontein. It is also naturalised in Namibia. It was recorded as an invader in Australia.

Fruit from what is most likely a single clone on the outskirts of Pretoria was sterile or had up to three seeds. Another possible clone was recorded 51 km toward Rustenburg along the N4 Platinum highway, and was confined to a single bushclump. The trunk shows the vestiture of long, white, flexible bristles, yet the fruit lacked (or had already shed) the similar 'vestiture' shown in Anderson's (2001) figure. In fire-prone savanna habitat in South Africa, the trunk vestiture is often burnt off, complicating the correct identification of specimens.

Scheinvar *et al.* (2009) treated this taxon as *Opuntia spinulifera*, and applied the name *O. leucotricha* only to plants lacking the long, bristly 'vestiture' on fruit and trunk. However, intermediate plants found in South Africa do not fit that distinction, therefore the name *O. leucotricha* is here applied in a broader concept. Further research is needed on this group of Mexican species.



Fig. 195. *Opuntia leucotricha* DC. (Picture by Pieter J.D. Winter)



Fig. 196. Velvety cladode surface of *Opuntia leucotricha* DC.
(Picture by Pieter J.D. Winter)

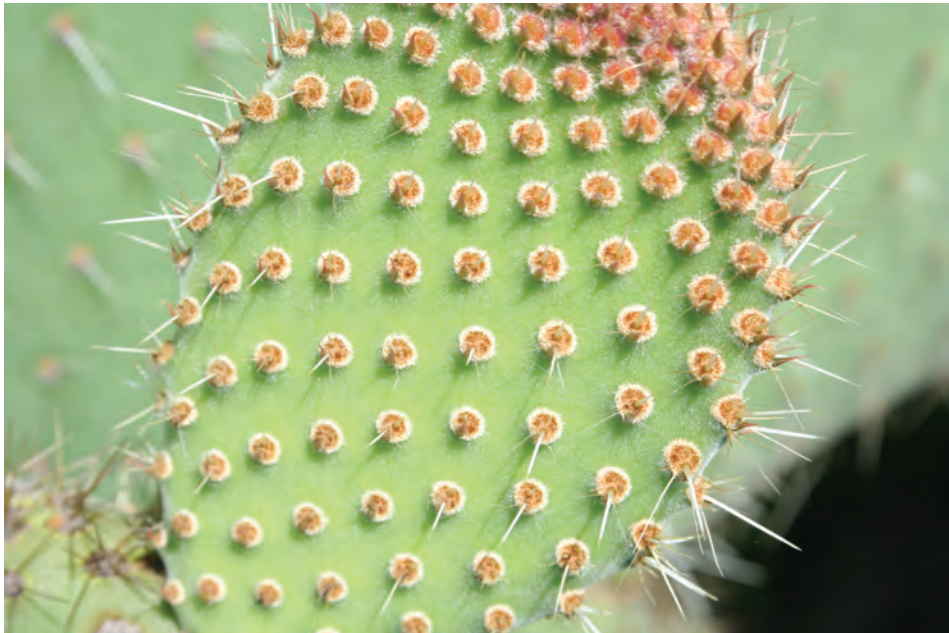


Fig. 197. Young cladode of *Opuntia leucotricha* DC. with small, subulate leaves and reddish glochidia. (Picture by Pieter J.D. Winter)



Fig. 198. Old bearded cladode of *Opuntia leucotricha* DC.
(Picture by Pieter J.D. Winter)

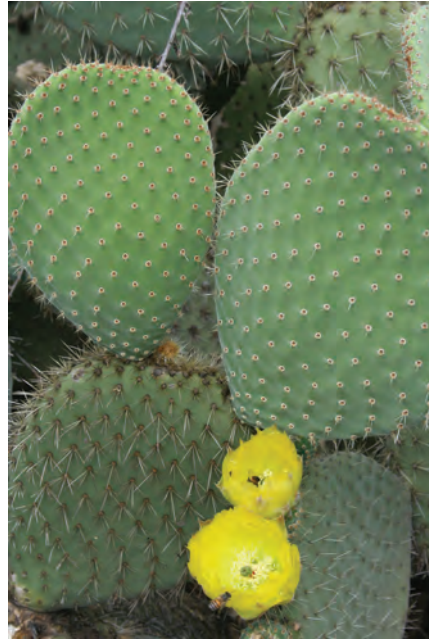


Fig. 199. Flower of *Opuntia leucotricha* DC. (Picture by Pieter J.D. Winter)



Fig. 200. Fruit of *Opuntia leucotricha* DC. (Picture by Pieter J.D. Winter)