

South Africa's ongoing *Opuntia* Mill. (Cactaceae) problem: the case of *Opuntia tomentosa* Salm-Dyck

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Summary: *Opuntia tomentosa* Salm-Dyck is recorded as having become naturalised in the Eastern Cape Province of South Africa. A description and illustrations of the species in South Africa are provided, along with a discussion of the characters that distinguish it from *Opuntia ficus-indica* (L.) Mill., the only other tree-like opuntia that has become naturalised in the country.

Zusammenfassung: *Opuntia tomentosa* Salm-Dyck wird als verwildert für die Eastern Cape-Provinz von Südafrika nachgewiesen. Es wird eine Beschreibung mit Abbildungen des Taxons in Südafrika gegeben, zusammen mit einer Diskussion der Merkmale, die es von der einzigen weiteren, im Land verwilderten baumförmigen Opuntienart *Opuntia ficus-indica* (L.) Mill. unterscheiden.

Introduction

A comprehensive survey indicated that, until recently, 12 species (13 taxa) of *Opuntia* were accepted as naturalised in South Africa (Smith *et al.*, 2011; Walters *et al.*, 2011). A further species, *Opuntia tomentosa* Salm-Dyck, was recently encountered as established in the Eastern Cape Province, near the small hamlet of Hamburg in close proximity to East London, increasing these numbers to 13 and 14, respectively. The species spreads unaided by humans and covers a small area in the flood plains of the Keiskamma River near the mouth of the river.

Opuntia tomentosa (or *Cactus tomentosus*) has been known in cultivation in Europe since the beginning of the 17th century, having been depicted by Basilius Besler (1561–1629) in “Hortus

Eystettensis”, as one of the plants growing in the garden of the bishop of the diocese of Eichstatt (Rowley, 1997). However, application of the name *O. tomentosa* Salm-Dyck has been the subject of some controversy following its use by Crook & Mottram (2001: 113, 2004: 58) for the species commonly known as *O. pubescens* J.C.Wendl. ex Pfeiff. (see Rowley, 1999 and Crook & Mottram, 2004: 58 for a discussion). Leuenberger (2002: 147) concluded that “...[*Opuntia tomentosa*] is in long-established use for a Mexican species fitting well the original description of an erect, flat-stemmed plant with much larger stem segments than the low growing *O. pubescens*” and commented that from the protologues (Salm-Reifferscheid-Dyck, 1822) the two names refer to two distinct species. Hunt (2006: 13) and Hunt *et al.*, (2006a: 212) independently arrived at the same conclusion. We therefore consider the name *Opuntia tomentosa* Salm-Dyck as applicable to the material naturalised in South Africa.

In this paper *O. tomentosa* is for the first time described as it occurs in South Africa. To facilitate identification, the vegetative and reproductive morphology of the species are illustrated, especially since the comprehensive work of Hunt *et al.* (2006b) did not carry illustrations of the species. Differences between *O. tomentosa* and *O. ficus-indica* (L.) Mill., the only other tree-like opuntia naturalised in South Africa, are provided.

Opuntia tomentosa established in South Africa

A recent fieldtrip to the eastern and central parts of the Eastern Cape Province of South Africa included a survey of the vegetation near Hamburg,



Figure 1. Clumps of *O. tomentosa* photographed near Hamburg, Eastern Cape, South Africa. The Keiskamma River is visible in the background on the right. **Figure 2.** The pads of *O. tomentosa* are velvety, unlike those of *Opuntia ficus-indica*. **Figure 3.** The areoles on the pads of *O. tomentosa* are slightly elevated giving the surface a longitudinally ribbed appearance. **Figure 4.** The flowers of *O. tomentosa* are a bright orange-red. **Figure 5.** When ripe, the in- and outside of the velvety fruit of *O. tomentosa* are dull red. Photos: Gideon F. Smith.

a small coastal town south of East London. The reasonably unspoilt resort – it is hardly a town – was established on the mouth of the Keiskamma River and is popular among water sports enthusiasts. *Opuntia tomentosa* was encountered a few kilometers outside of the hamlet where several mature clumps are dotted around the landscape, straddling the road leading to the residential and recreational area (Figure 1).

Like most species of *Opuntia* Mill., *O. tomentosa* is easy to propagate, especially from cuttings. Pads detached at the joint or constriction between segments are simply placed erect in the soil where they are intended to grow. When so treated, these stem sections strike root easily, and grow rapidly into medium-sized to large clump-like trees consisting of a dense network of large, oblong to obovate to asymmetrical pads.

It is not known how, when, or for what purpose the plants were introduced into South Africa, nor how they reached Hamburg – there is no plant nursery nearby – but they could have been discarded from domestic town or rural gardens. It did not appear that propagules were washed down the river. Most cacti (and other succulents for that matter) that have become naturalised in South Africa invaded natural vegetation as escapes from gardens (Walters *et al.*, 2011), and it is likely that the ornamental fruits and flowers, as well as its generally ‘neater’, tree-like appearance made *O. tomentosa* more desirable than *O. ficus-indica* to be grown as a garden subject. Chromosome counts indicate that it is a polyploid (Pinkava, 2002) and most likely of hybrid origin (Majure *et al.*, 2012). It is therefore not impossible that the material now established in South Africa is a cultivar derived from a single clone, especially in view of how easy it is to propagate by vegetative means.

Distinguishing *Opuntia tomentosa* from *O. ficus-indica*

The most obvious difference between *Opuntia tomentosa* and *O. ficus-indica* is that the surfaces of the pads of the former have a soft, furry covering reminiscent of velvet fabric (Figure 2). It also tends to be more tree-like and the stems and branches tend to remain erect and do not break off as easily as those of *O. ficus-indica*, which tends to form tree-like shrubs. The areoles of *O. tomentosa* are very slightly elevated, especially during periods of water stress, giving the pads a longitudinally ribbed appearance (Figure 3), while the areoles of *O. ficus-indica* are mostly flush with the surface of the pads. Plants of *O. tomentosa* take many years to reach flowering maturity, after which delicate, bright orange-red flowers are

carried in the summer months (Figure 4). Once *O. tomentosa* bears fruit there is no mistaking its smaller prickly pears as these are furry and bright red on the in- and outside (Figure 5), unlike those of *O. ficus-indica*, which are most commonly light green on both the in- and outside (although some cultivars do have brightly coloured fruit).

It should be pointed out though that, although *O. tomentosa* is easily distinguished from *O. ficus-indica* and *O. pubescens*, other arborescent and large, shrubby opuntias cultivated in Mexico for their edible fruits, might be found in South Africa.

Opuntia tomentosa Salm-Dyck in *Obs. bot.* 3: 8 (1822). Borg (1963: 83–84); Britton & Rose (1963: 173–174); Backeberg (1977: 377); Anderson (2001: 523); Hunt *et al.* (2006a: 212).

= *Cactus tomentosus* Link in *Enumeratio plantarum horti Regii Botanici Berolensis altera* 2: 24 (1822). Although the authority of this name is sometimes cited as ‘(Salm-Dyck) Link’, there is no reference to Salm-Dyck in Link’s publication. Link’s *Enumeratio* was published in the same year as Salm-Dyck’s *Observationes* so it is unlikely that he was aware of Salm-Dyck’s name.

In the literature the following names have been associated with what we consider constituting *O. tomentosa*.

- *Opuntia hernandezii* DC. in *Prodromus* 3: 474 (1828); *Mém. Mus. Hist. Nat.* 17: 69, t. 16 (1828). *Opuntia tomentosa* Salm-Dyck var. *hernandezii* (DC.) Bravo in *Cact. Suc. Mex.* 20: 96 (1975).
- *Opuntia oblongata* J.C.Wendl. ex Pfeiff. in *Enumeratio diagnostic cactearum hucusque cognitarum*: 161 (1837) and *Beschreibung und Synonymik der Cacteen*: 180–181 (1837). An earlier reference, *Catalogus hortus Herrenhusanus* (1835), cited by Pfeiffer for several Wendland names is unknown, therefore these names are considered to be validated by Pfeiffer (Britton & Rose 1963: 101).
- *Opuntia macdougaliana* Rose in Britton & Rose in *Smith. Misc. Collect.* 50: 516 (1908). *Opuntia velutina* var. *macdougaliana* (Rose) Bravo in *Cact. Suc. Mex.* 17: 119 (1972).
- *Opuntia icterica* Griffiths in *Monatsschr. Kakteenkunde* 23: 138 (1913).
- *Opuntia spraguei* J.G.Ortega in *Boletín de Pro-Cultura Regional. Mazatlan* 1(13): Fam. Cact. (1930). *Opuntia tomentosa* Salm-Dyck var. *spraguei* (J.G.Ortega) Backeb. in *Cactaceae (Backeberg)* 1: 542 (1958) as ‘Spranguei’. *O. spraguei* is accepted by some authorities (e.g. Tropicos).
- *Opuntia rileyi* J.G.Ortega in *Boletín de Pro-Cultura Regional. Mazatlan* 1(13): Fam.

Cact. (1930). *Opuntia tomentosa* Salm-Dyck var. *rileyi* (J.G.Ortega) Backeb. in *Cactaceae* (Backeberg) 1: 542 (1958). *O. rileyi* is accepted by some authorities (e.g. Tropicos).

- *Opuntia sarca* Griffiths ex Scheinvar in *Phytologia* 49: 328 (1981).
- *Opuntia tomentosa* Salm-Dyck var. *herrerai* Scheinvar in *Phytologia* 49: 332 (1981).

Much-branched, tree-like succulent perennial, erect, 3.0–6.0 m tall. Stem segments (pads) dull to deep green, asymmetrically oblong to oval-shaped, 15.0–30.0 × 12.0–16.0 cm. Areoles prominent, slightly raised, round, widely dispersed on pads. Needle-like spines often absent, sometimes a single short to medium-long, straight, awl-shaped one present on an areole. Glochids dense, fine, bristle-like, yellowish, turning greyish. Flowers 40–55 mm long, bright orange-red; petal tips slightly frilly. Fruits obovoid to globose one-celled berry, 3.0–5.0 cm long, 2.5–4.0 cm in diameter, fleshy, egg-shaped to globose, dull red, covered with scattered areoles bearing dense clusters of glochids.

Common names: Afrikaans: fluweelturksvy; English: velvet opuntia, a common name also applied to *Opuntia velutina* F.A.C. Weber; Spanish: nopal de San Gabriel (Anderson, 2001).

Distribution in South Africa: The species is here for the first time recorded from South Africa's Eastern Cape Province. It was found in natural vegetation near the small town of Hamburg. This coastal town falls in the indigenous succulent-rich Albany Centre of Endemism (Van Wyk & Smith, 2001).

Origin: Mexico, where it is widely cultivated, obscuring its exact origin (Hunt *et al.*, 2006a). Anderson (2001) also records the species for Guatemala.

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References

ANDERSON, E.F. (2001). *The cactus family*. Timber Press, Portland, Oregon.
BACKEBERG, C. (1977). *Cactus lexicon*. Enumeratio diagnostica Cactacearum. Blandford Press, Poole, Dorset.
BORG, J. (1963). *Cacti. A gardener's handbook for their identification and cultivation*. [Reissue

of the 3rd ed., first published in 1959.] Blandford Press, London.

BRITTON, N.L. & ROSE, J.N. (1963). *The Cactaceae. Descriptions and illustrations of plants of the cactus family*. 1. [Facsimile of the 1937 large paper 2nd ed.] Dover Publications, Inc., New York.
CROOK, R. & MOTTRAM, R. (2001). *Opuntia* index. Part 7: Nomenclatural note and P–Q. *Bradleya* 19: 91–116.
CROOK, R. & MOTTRAM, R. (2004). *Opuntia* index. Part 10: T–V. *Bradleya* 22: 53–76.
HUNT, D. (2006). *Opuntia*. In D. HUNT & N. TAYLOR (eds.) *Notulae Systematicae Lexicon Cactacearum Spectantes VII. Cact. Syst. Init.* 21: 12–13.
HUNT, D., TAYLOR, N. & CHARLES, G. (eds.) (2006a). *The new cactus lexicon. Text*. dh books, Milborne Port, England.
HUNT, D., TAYLOR, N. & CHARLES, G. (eds.) (2006b). *The new cactus lexicon. Atlas of illustrations*. dh books, Milborne Port, England.
LEUENBERGER, B.E. (2002). Humboldt & Bonpland's Cactaceae in the herbaria at Paris and Berlin. *Willdenowia* 32: 137–153.
MAJURE, L.C., PUENTE, R., GRIFFITH, M.P., JUDD, W.S., SOLTIS, P. & SOLTIS, D.E. (2012). Phylogeny of *Opuntia* s.s. (Cactaceae): clade delineation, geographic origins, and reticulate evolution. *Amer. J. Bot.* 99: 847–864.
PINKAVA, D. (2002). On the evolution of the continental North American Opuntioideae. *Succ. Pl. Res.* 6: 59–98.
ROWLEY, G.D. (1997). *A history of succulent plants*. Strawberry Press, Mill Valley.
ROWLEY, G.D. (1999). Salm-Dyck's cactus paintings. *Bradleya* 17: 1–26.
SALM-REIFFERSCHIED-DYCK, J.M.F.A.H.I. (1822). *Observationes botanicae in Horto Dickensi notatae*. Fasc. 3. Coloniae [Cologne].
SMITH, G.F., FIGUEIREDO, E., BOATWRIGHT, J.S. & CROUCH, N.R. (2011). South Africa's ongoing *Opuntia* Mill. (Cactaceae) problem: the case of *O. microdasys* (Lehm.) Pfeiff. *Bradleya* 29: 73–78.
VAN WYK, A.E. [BRAAM] & SMITH, G.F. (2001). *Regions of floristic endemism in southern Africa. A review with emphasis on succulents*. Umdaus Press, Hatfield, South Africa.
WALTERS, M., FIGUEIREDO, E., CROUCH, N.R., WINTER, P.J.D., SMITH, G.F., ZIMMERMANN, H.G. & MASHOPE, B.K. (2011). *Naturalized and invasive succulents of southern Africa*. ABC Taxa, 11. The Belgian Development Cooperation, Brussels.