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The type specimen of *Opuntia cardiosperma* (Cactaceae), new synonyms and new records from Argentina and Paraguay

Abstract

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The type specimen of *Opuntia cardiosperma* (Cactaceae) from Paraguay, extant in the spirit collection of the Berlin-Dahlem herbarium, is illustrated. Comparison with unidentified specimens from Paraguay and northern Argentina revealed that the species is widespread but has been confused with *O. paraguayensis*. An amplified description of *O. cardiosperma* is provided. *O. chakensis* and *O. mieckleyi* are treated as new synonyms of *O. cardiosperma*.

Introduction

Opuntia cardiosperma was described by Schumann (1899) from Paraguay, treated again by Schumann (1903) and mentioned for Paraguay by Dams (1903), but has remained an insufficiently known taxon ever since. Although the type specimen of *O. cardiosperma* was reported by Leuenberger (1978, 1979) as extant in the spirit collection at Berlin-Dahlem (B), its connection with plants occurring in the field was only recently established during the study of comparable liquid-preserved material, by field observations in Argentina and by the study of unidentified herbarium material from Paraguay. Published illustrations of the species are scarce, and the earliest one to appear under that name has been the source of confusion due to a misidentification. The drawing of “*O. cardiosperma*” in Britton & Rose (1919: 157, fig. 197), based on a living plant in the New York Botanical Garden received from the Hanbury Gardens at La Mortola in 1913, was already considered to be doubtful by Backeberg (1958). Berger (1929) did not mention *O. cardiosperma*.

Hunt (1999) listed *Opuntia cardiosperma* as provisionally accepted species for Paraguay. The species is not mentioned by Kiesling (1999) and Lambert (1993, 1998) for Argentina. In late 1999, I became fully aware of the occurrence of *O. cardiosperma* in Argentina during the revision of unidentified material of *Opuntia* in the Castellanos collection (in spirit) at the Museo de

Ciencias Naturales (BA) in Buenos Aires and of unidentified *Opuntia* material at the herbarium of the Instituto de Botánica del Noreste, Corrientes (CTES). The presence of the taxon in Argentina was further confirmed during field studies in the provinces of Entre Ríos and Corrientes. Additional material from Paraguay was subsequently found among unidentified specimens of *Opuntia* at AS, MO, and SI.

The type material of *Opuntia cardiosperma* and the circumscription of the species

The obligate lectotype specimen discovered by the author in 1978 in the spirit collection at Berlin-Dahlem in jar no. 54 of the *Cactaceae* bears the label “*Opuntia brachyacantha*. Paraguay, leg. Anisits n. 64”. This is an unpublished name. The collection number of Anisits is the one cited by Schumann (1899: 153) as the only specimen for *Opuntia cardiosperma*. The specimen agrees perfectly with the protologue and no other material is known. It is illustrated in Fig. 1.

Comparison of the type specimen with the material cited below revealed striking similarities which leave no doubt on the identity. The fragmentary nature of additional samples and the lack of indication of flower colour in some collections still pose problems for the safe identification in numerous cases. The taxonomic circumscription of the species and its full geographical distribution needs to be corroborated with additional field studies. Further documentation by representative herbarium material complemented by photographs is necessary.

In comparison with the type material, the drawing of “*Opuntia cardiosperma*” in Britton & Rose (1919: 157, fig. 197) is indeed not typical in shape and spination and looks more like a depauperate form of *O. salagria* Castellanos

Similarly, material formerly cultivated under the name *Opuntia cardiosperma* at the Botanic Garden Berlin-Dahlem does not appear to be authentic. It has circular or broadly obovate stem segments and areoles, and spination similar to a plant illustrated by Backeberg (1958: 558, fig. 542) as *O. haematocarpa* Berger, which is a doubtful taxon not listed by Hunt (1999).

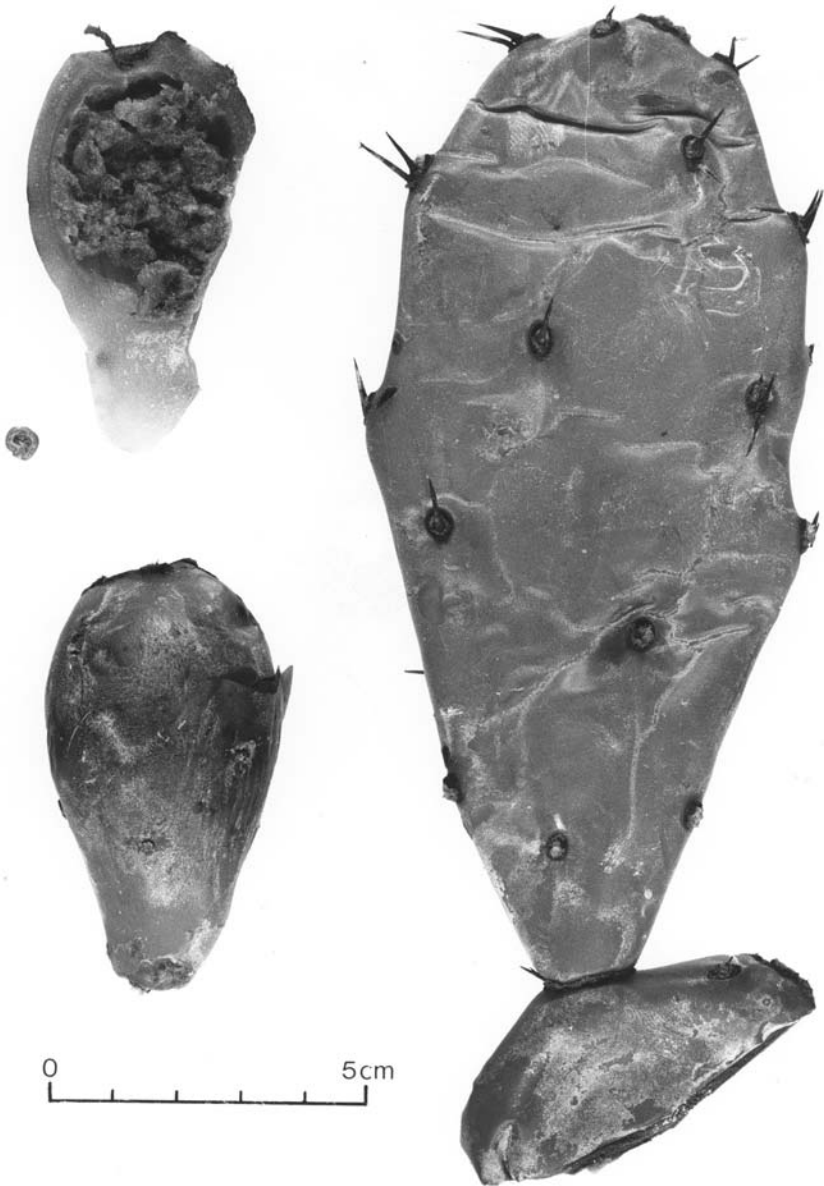
On the contrary, the illustration of *Opuntia cardiosperma* published by Backeberg (1958: 405, fig. 413), a photograph of a plant without any indication of origin, agrees remarkably well with the type material even though it is unlikely that Backeberg knew the original material.

Ritter (1979) treated *Opuntia cardiosperma* for Paraguay, citing his collection *FR 1204*. This number is represented by a single, fragmentary specimen located at the Museo Nacional de Historia Natural in Santiago de Chile (SGO) according to Egli & al. (1996). The locality was given as “Alto Paraguay, Puerto Casado, Nr. 5”. Ritter provided no illustration, but according to his detailed description he correctly identified the species without knowing the type specimen.

Some specimens kept in herbaria under the name *O. chakensis* Spegazzini also belong to *O. cardiosperma*. Although *O. chakensis* is proposed here as new synonym of *O. cardiosperma*, this does not mean that all material mentioned in literature or found under this name in herbaria belongs here. It needs to be critically assessed and compared with *O. elata* Salm-Dyck, a close relative of *O. cardiosperma*, subject to a separate study on *O. ser. Elatae*, where a key to the species will be provided (Leuenberger, in prep.)

As a further result of this revision it was found that living material kept under the name *Opuntia paraguayensis* K. Schum. in living collections, e.g. at Berlin-Dahlem, also belongs to *O. cardiosperma*. The name *O. paraguayensis* was misapplied and is treated in a separate paper (Leuenberger 2001).

The name *Opuntia cardiosperma* has not so far appeared in publications on invasive species of *Opuntia* naturalized in Australia and known as “pest prickly pears” to which biological control methods are applied (Hosking & al. 1988, Forster 1996). However, in the course of this study, some plants reported for southern and southeastern Australia under the name *O. paraguayensis* by Telford (1984: 69), Swinbourne (1986: 335), Hosking & al. (1988), Harden (1990: 204), Parsons & Cuthbertson (1992) and Stajsic & Carr (1996: 126) have been tentatively identified as *O. cardiosperma* or *O. elata*. The illustrations (drawings) and descriptions are not sufficient for a safe identification, but some voucher specimens kept as *O. paraguayensis* in two Australian herbaria



Opuntia cardiosperma Schumann
Anisits 64 (Type)

Fig. 1. *Opuntia cardiosperma* K. Schum. – lectotype specimen from Paraguay, *Anisits (Cact. n.) 64* (B alc). – Photograph by S. Jakob.

(CBG, MEL) approach *O. cardiosperma*. It is remarkable that no plants of the affinity of *O. paraguayensis*, *O. cardiosperma* and *O. elata* were listed by Schumann (1899b). None of the plants illustrated by Mann (1970) can be referred to this group.

Hosking & al. (1988) noted that no records exist of the introduction of plants identified as *Opuntia paraguayensis* and that this species was not mentioned in the early Commonwealth Prickly Pear board bulletins. The further revision of Australian specimens of "*O. paraguayensis*" is under way together with the analysis of material hitherto identified as *O. bonaerensis* and *O. elata* from Argentina and Uruguay.

Systematic treatment

Opuntia cardiosperma K. Schum. in Monatschr. Kakteenk. 9: 150. 1899. – Fig. 1, 2

Type (obligate lectotype, here designated): Paraguay, near Recoleta, in the vicinity of Asunción, 3.3.1899 (fr), *Anisits (Cact. n.)* 64 (B alc).

= *Opuntia chakensis* Speg. in Anales Mus. Nac. Buenos Aires 11: 519. 1905, **syn. nov.** – Type not stated. Distribution given as [Argentina and Paraguay?], "Chaco borealis et australis, Misiones et facile etiam in ditone Montevidensi" [Uruguay]. – Lectotype (designated by Crook & Mottram 1996: 106): Photo of *Opuntia chakensis*, later published by Spegazzini (1925: 95, uncounted fig.), reproduced by Kiesling (1984: 127).

Note. – Spegazzini (1925) mentioned "la foto del ejemplar original típico" (the photograph of the original typical [or type] specimen) but reproduced two photographs, one of the whole plant, and one showing individual stem segments with flowers and fruits. The first illustration is well compatible with the species concept adopted here and together with the description of spine characters strongly supports the inclusion of this taxon in *Opuntia cardiosperma*. The second illustration (Spegazzini 1925: 96) is remarkably similar to that of *O. anacantha* Speg. reproduced by Kiesling (1984: 239). Britton & Rose (1919: 158) considered *O. chakensis* to be a synonym of *O. bonaerensis* Speg. (Spegazzini 1901, not 1904 as cited by Britton & Rose). Kiesling (1999) lists the name as "*O. chaquensis*", a spelling not used by Spegazzini. According to the "Index kewensis" (1997), the most frequent epithet for taxa originating from the Chaco is "chacoensis". The plant illustrated by Backeberg (1958: 403, fig. 411) as *O. chakensis* is *O. cardiosperma*.

= *Opuntia mieckleyi* K. Schum., Blüh. Kakt. 1: t. 44. 1903, **syn. nov.** – Syntypes: Paraguay, sine loc., *Grosse*; Estancia Loma near San Salvador, *Anisits* 48 (presumably at B, destroyed). – Lectotype (designated by Crook & Mottram 2000: 128): plate 44 in Schumann, Blüh. Kakt. 1. 1903, based on living material received from Grosse.

Note. – Herbarium material deposited at US of this taxon labelled as "*Opuntia mieckleyi* from Berlin" (US 3054292) without further information is presumably prepared from living material received from Berlin. It is posterior and not eligible for lectotypification in the same way as two sheets formerly kept as type material of *O. mieckleyi*, cult. 8.8.1913 at P.I.G., without details of origin, *Griffiths* 9256 (US 2979163, 3012633). P.I.G. (according to the label, part of "Farm-Management Investigations of the U.S. Department of Agriculture") stood for "Plant Introduction Garden", which was in Chaco, California, where D. Griffiths cultivated opuntias (according to K. Rankin and C. Tuccinardi at US, pers. comm.). Berger (1929) noted that the species was similar to *O. elata* but had narrower, thinner stems, unarmed, or with few small spines. This agrees well with *O. cardiosperma*. Backeberg (1958) did not illustrate *O. mieckleyi*. Crook & Mottram (2000) made no comments on the affinities of *O. mieckleyi*.

Ic. – Arenas 1981: 263, fig. 50B (as *O. paraguayensis*); Backeberg (1958: 405, fig. 413); Fehser & Dimitri 1972: 655, fig. 187A (as *O. bonaerensis*); Spegazzini (1925: 95, as *O. chakensis*).

Succulent shrub, erect, to 1-2 m tall. *Stem* segments obovate-oblong, with narrowed base, c. 9-20(-30) × 5-7 cm, 1-1.5(-2) cm thick, fresh green to glossy dark green when young, later dull dark green, often with a darker zone around or below the slightly elevated areoles. Basal stem



Fig. 2. *Opuntia cardiosperma* K. Schum. from Corrientes (Argentina), leg. *Leuenberger & Arroyo-Leuenberger 4749*, material for the herbarium prior to drying (photograph by B. Leuenberger).

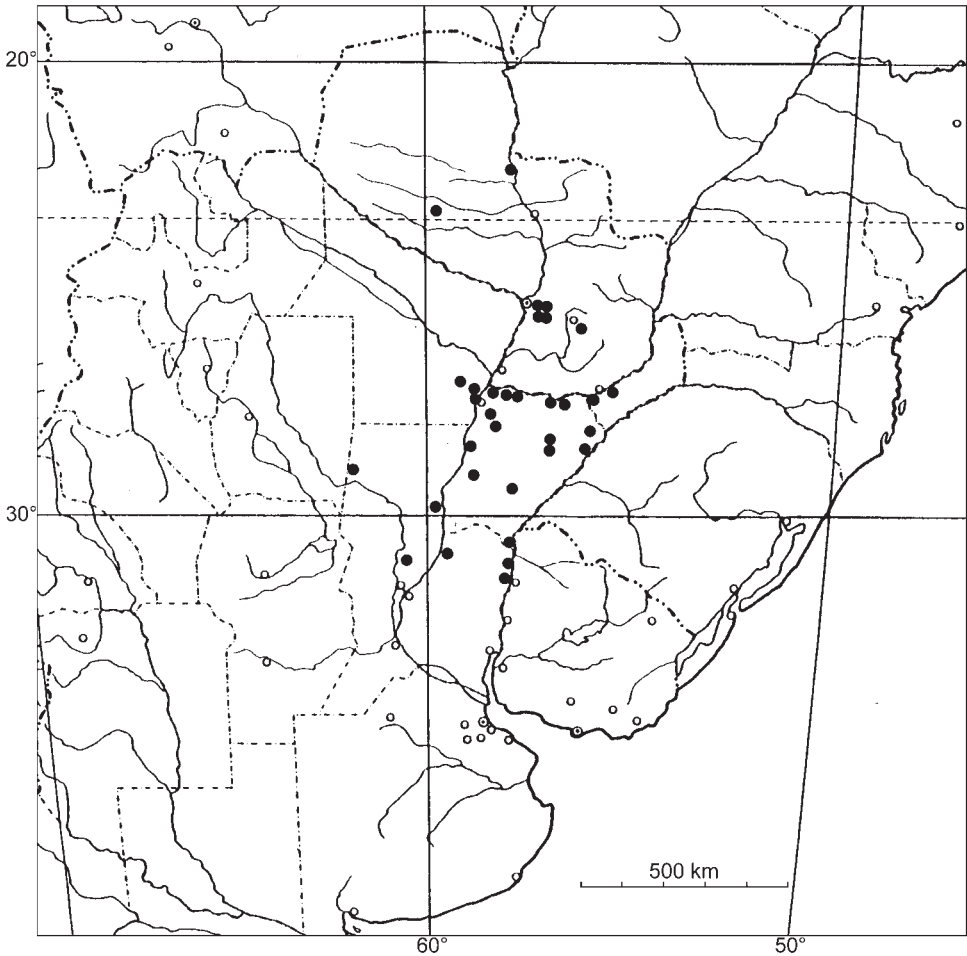


Fig. 3. Distribution of *Opuntia cardiosperma* (●) in Paraguay and NE Argentina.

segments longer and thicker. Mucilage canals conspicuous in transverse section. *Leaves* minute, subulate, straight or recurved, 3-5 × 1-2 mm, green, soon deciduous, usually lacking in dried specimens except on very young growth. *Areoles* c. 15-20(-30) visible on either side, 3-5 cm distant, circular to longitudinally elliptic, to 3-5 mm diam., with conspicuous short and dense, white tomentum on young growth, later becoming grey; reddish glochids usually present in the upper part of the areoles but nearly always hidden in the tomentum. *Spines* usually present on few areoles only, rarely on about half of them, 1 or 2, subulate, 0.5-1(-2) cm long and 0.5-1 mm thick at base, usually brown, becoming grey to whitish. Some longer (to 4 cm) grey spines sometimes present on few areoles of old basal segments, occasionally also on distal segments. *Flower buds* with obconical, green receptacle, corolla rounded, green, becoming reddish before anthesis. *Flowers* few to numerous on distal stem segments, mostly on the margin but also on the sides, c. 7 cm long and 6-8 cm diam. *Receptacle* obconical to obovate, variable in shape and size, c. 3 × 1.5 cm, green, with c. 7-10 areoles visible on either side with dense, short, white tomentum, upper areoles with short reddish glochids and occasionally with 1-2 acicular spines, lower areoles with white to grey tomentum only. *Sepaloids* broadly ovate with an acute point, reddish, with a

reddish apex, the inner ones orange. *Petaloids* widely spreading, obovate spatulate, 3-4 × 1-2 cm, orange. *Stamens* numerous, 1-1.5 cm long, with cream filaments and anthers; pollen yellow. *Style* fusiform, c. 3 cm long, white to cream. *Stigma lobes* 5-7, c. 5 mm long, cream. *Fruit* obovate to pear-shaped, 3-7.5 × 2-3.8 cm; immature fruit green or with purplish spots around the upper areoles, purplish red when mature, upper areoles with fascicles of 2-3 mm long reddish glochids, all areoles with short grey tomentum. Umbilicus conspicuous, about half the diameter of the fruit, slightly to notably depressed, brown. Fruit green inside, seeds embedded in a green fibrous to (at maturity) juicy pulp formed by mucilaginous funicular hairs covering part of the seed (hence the seeds described as hairy). *Seed* covered by bony aril, lenticular cordate, 4-6 mm diam., 2.5-3 mm thick, pale brown, with a conspicuous peripheral furrow and bulging, rounded 1 mm broad rim, partly covered by mucilaginous hairs, but with mostly smooth bony surface when dry or cleaned.

Distribution. – Paraguay and NE Argentina (Fig. 3). The possible presence in adjacent Brazil (Rio Grande do Sul, Matto Grosso), Uruguay and E Bolivia needs to be confirmed by vouchers. In Argentina, the species occurs naturally in the phytogeographical formations of the Chaco and Espinal (Cabrera 1994), growing at the fringe and in low forest, in barrancas and in thickets with bromeliads. It is also found on roadsides, in secondary vegetation and in waste places. For Paraguay, herbarium labels indicate savanna on clay soil, inundated savanna and palm forest as habitats. A range extension into SW Brazil (Matto Grosso) and E Bolivia seems possible. The plant treated and illustrated by Arenas (1981: 262, 263, fig. 50B) under *O. paraguayensis* from W Paraguay (Arenas 1563) is most probably *O. cardiosperma* K. Schum. The plants mentioned by Cárdenas (1968) under the name *O. chakensis* may belong here also or to *O. elata*. Plants in cultivation and naturalized in Australia (Victoria and New South Wales), hitherto known as *O. paraguayensis*, may in part be *O. cardiosperma*.

Specimens examined. – See electronic supplement, <http://www.bgbm.fu-berlin.de/bgbm/library/publikat/willd31/leuenberger.htm>.

Notes and observations

Schumann (1899, 1903) placed *Opuntia cardiosperma* in his heterogeneous *O. ser. Armatae* K. Schum., in which he included other taxa from Paraguay such as *O. assumptionis* and *O. stenarthra*. All three were based on material preserved in spirit, received from Anisits (Schumann 1899: 132, 133). Chodat & Hassler (1903) did not mention *O. cardiosperma* in an annotated list of cacti of Paraguay collected by Hassler and identified by Schumann.

Opuntia cardiosperma belongs to a species complex of closely related and still insufficiently understood taxa including *O. monacantha* Haw., *O. elata* Salm-Dyck, *O. salagria* Castellanos, *O. assumptionis* K. Schum. and *O. bonaerensis* Speg. All these except *O. assumptionis* (which was not treated by him) were placed by Castellanos (1957: 28) in *O. subsect. Vulgares* (Engelm.) Castellanos. Castellanos used the name *O. vulgaris* Mill. for *O. monacantha* Haw., hence the subsectional (but invalid) name (for the nomenclature of the species see Leuenberger 1993). Castellanos apparently did not know *O. cardiosperma*. Numerous specimens he collected and deposited in the herbarium and spirit collection at BA effectively remained unidentified until December 1999 when, in the course of this revision, they were annotated by the author as *O. cardiosperma*.

In Paraguay, more spiny plants well matching the description and illustration of *Opuntia delaetiana* (F. A. C. Weber) Vaupel (1913) need to be compared with *O. cardiosperma* in more detail. They may fall into the variation of the latter, but are provisionally accepted as a separate taxon, *O. delaetiana*, pending further evidence. Navarro (1996) did not mention *O. cardiosperma* for Bolivia. The plants listed as *O. paraguayensis* (incl. *O. chakensis*, *Platyopuntia interjecta* and *P. pyrhantha*) could at least in part be *O. cardiosperma* or *O. elata*.

The identification of specimens from Australia as *Opuntia cardiosperma* (see specimens examined) is only at an initial stage and still somewhat tentative. Further material may prove to belong to this species, but the herbarium material alone is often not sufficient for safe identification. Some specimens are difficult to identify beyond doubt and may rather belong to the closely related *O. elata*. Very fragmentary herbarium material is even difficult to distinguish from the superficially similar *O. stricta* (Haw.) Haw., a species of North American origin widely distributed as a pest in Australia but as living plant well distinct with spineless, dull green to glaucous stems, yellow flowers and fruit with purple staining juice.

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