
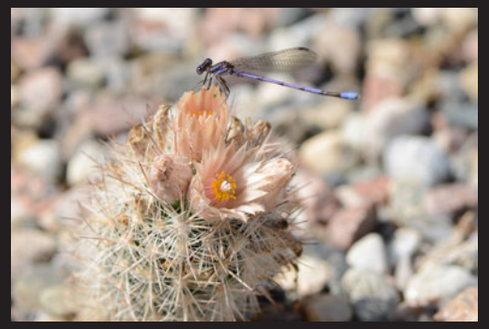

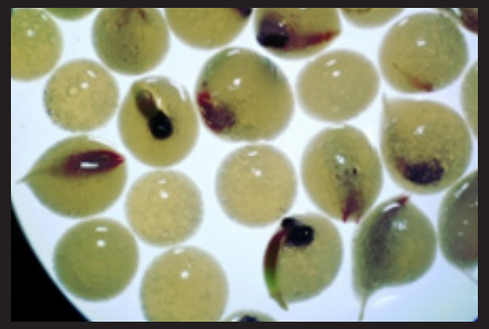
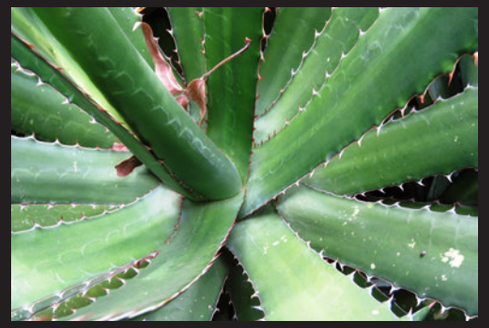




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EDITOR: JAMES MAUSETH
1110 Blanco Street
Austin,
TX 78703
USA
email: Haseltonia.Editor@gmail.com

MANAGING EDITOR,
DESIGN & LAYOUT:
TIM HARVEY
cssj_editor@hotmail.com

PRINTING LGI BINDERY
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Cactus and Succulent Society of America,
PO Box 1000,
Claremont,
CA 91711 USA.

This issue was mailed 30th December 2020.

Front cover: Female flowers of *Adenia natalensis* . Photo by Neil R. Crouch.

Back cover:

Left column, top to bottom: flowers of *Kalanchoe crouchii*; *Tylecodon ectypus*; *Agave lophantha*; *Kalanchoe dinklagei*; *Trichocereus hahnianus.*

Right column, top to bottom: *Coryphantha sneedii* var. *villardii*; synseeds of *Ferocactus peninsulae*; *Rhipsalis rhombea*; ×*Haagespostoa climaxantha; Peperomia ricardofernandezii*.

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Mediocactus hahnianus: a resolved enigma and a new chapter of its history

Roberto Kiesling[1*], Lidia Pérez de Molas[2], Luis Oakley[3], Daniel Schweich[4], M. Laura las Peñas[5], Aymeric de Barmon[6] & Detlev Metzing[7]

[1]IADIZA-CONICET. C. C. 507. (5500) Mendoza. Argentina.
[2] Universidad Nacional de Asunción, Facultad de Ciencias Agrarias (FCA-UNA). Paraguay.
[3] Cátedra de Botánica, Facultad de Cs. Agrarias, Universidad Nacional de Rosario, Campo Experimental José Villarino, C.C. 14, (2125) Zavalla, Santa Fe, Argentina.
[4]Retired from CNRS, 5 rue J. Verne, 69330-Jonage, France. email: lobivia@cactuspro.com
[5]Instituto Multidisciplinario de Biología Vegetal, CONICET (IMBIV), FCEFyN-UNC, C.C. 495, (5000) Córdoba, Argentina.
[6]ADBLPS, BP35, F-89140 Pont sur Yonne, France. info@adblps-graines-cactus.com
[7]Federal Agency for Nature Conservation, Div. Plant Conservation, Konstantinstr. 110, 53179 Bonn, Germany. email: detlev.metzing@bfn.de

* Author for correspondence: rkiesling@mendoza-conicet.gob.ar

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Abstract: The first discovery of *Mediocactus hahnianus* was attributed to Harry Blossfeld. Based on literature analysis, it is shown that T. Rojas and A.M. Friedrich plausibly made the discovery in the mid-1930s, and that seeds or cuttings were then given to Marsoner and eventually arrived at R. Blossfeld's nursery via H. Blossfeld. Although cultivated in Europe by Hahn, the plant is presently known only from the clone grown by J. West in the US, and obtained from Rojas in 1937. Recently, a new colony has been found and it seems to be a single clone. It perfectly fits the US clone from the point of view of morphology, flowers, growth habit, chromosome number, and seed morphology, whereas the localities are 400 km away from each other. Taxonomy and nomenclature are discussed: We decided to retain the species in *Trichocereus*, using a conservative concept for the genus based on morphological characters. A neotype for *Mediocactus hahnianus* is designated here.

Keywords: Cactaceae, *Mediocactus hahnianus*, *Echinopsis*, *Trichocereus*, Paraguay

I. ORIGIN OF *MEDIOCACTUS HAHNIANUS*

Mediocactus hahnianus has been described based on material that Harry Blossfeld is said to have sent to the Hahn nursery and that probably originated from Paraguay (Backeberg 1959: 795, 1962: 3653).

Robert Blossfeld, a horticulturist and seed trader in Berlin, was specialized in succulents and published several seed catalogs. In the catalogs dated February 1936, R. Blossfeld (1936: 3) mentioned a collecting trip his son Harry made in 1935 together with Oreste Marsoner in Argentina and Bolivia, and he added "*...eventually in Uruguay and Paraguay*…". Furthermore, at page 35 of the same catalog, one can read:

"*The following unnamed species are available from the collecting trip of Harry Blossfeld through the South-American cacti regions … The most interesting collection of Paraguayan species (marked Py.) from the battle-regions in the Chaco-Boreal will remain the sole and unique importation of these rarities…*".

Seeds of five *Cereus* from Paraguay were offered on the same page. Perhaps the first one ("No. 200") could have been the later-named *Mediocactus hahnianus*, but the short mention of the white flowers, the creeping habit, and the reference to the *Harrisia* genus do not allow us to be certain; it may also have been a species of *Monvillea, Harrisia* or even *Selenicereus*.

More information on the South-American trip of 1935 is found in Harry's report, which was published both in German (H. Blossfeld 1936a), and English (H. Blossfeld 1935, 1936b). Therein he described in detail the travel together with Marsoner to W and NW Argentina. Near the last paragraph (H. Blossfeld 1935: 33, 1936b: 155) he briefly mentioned the activity after that trip:

> "*To have time for this task* [to collect at other areas]*, we separated in July* [1935] *and Herr Marsoner carried out the trip to Paraguay* [previously] *planned for later on and in a month of collecting obtained valuable material. Among them were cacti from the Chaco Boreal…*".

The report makes it clear that Marsoner traveled to Paraguay, whereas H. Blossfeld did not, and the apparent contradiction to R. Blossfeld's statements in the 1936 catalogue is based on a simplification therein.

H. Blossfeld subsequently made further journeys, one to Bolivia, Peru, Ecuador and Colombia in 1936, and "*a 3rd trip"* to NE Argentina, NW Uruguay and S of Brazil. Then he founded a nursery in the Brazilian state of São Paulo and later made further excursions, especially to search for orchids, his other interest (Secretaría de Verde e do Meio Ambiente 2012). No other reference was found to H. Blossfeld visiting Paraguay before or after 1936.

So, we have to conclude that H. Blossfeld never found *M. hahnianus* in Paraguay and that material of this species was probably obtained from an unknown source by O. Marsoner, who collected in Paraguay on behalf of the R. Blossfeld nursery.

Further insight about the putative origin of *Mediocactus hahnianus* can be found in the book of Günther Moser (1985), which is based on the correspondence and photos sent by Adolfo Maria Friedrich, who collected plants and seeds in Paraguay. There are many references in the book to Friedrich's disappointments with Marsoner and the Blossfelds (Moser 1985: 13–15, 111–112, 117, 119, 137), as the plant findings of Friedrich were attributed to H. Blossfeld and many mistakes were made regarding their habitats. Moser (1971: 4, 1985: 137) wrote

> "*all these discoveries made by Friedrich during the nineteen-thirties (1933–35) were bought up at the time by Oreste Marsoner on the instructions of Harry Blossfeld for the latter's father, Robert Blossfeld of Potsdam, near Berlin. However, the bulk of these plants actually went direct from Asuncion to the U.S.A. and Japan. And it was Yoshio Ito, the well-known Japanese cactus expert…*".

Concerning *Gymnocalycium friedrichii* var. *pazoutianum*, Moser & Valniček (1967: 9) and Moser (1985: 112) wrote

> "*the cactologist A.M. Friedrich, collected this variety in the years 1933–1935 in the northwest of Chaco Paraguayo … O. Marsoner bought… all plants collected by A.M. Friedrich and these came over Harry Blossfeld to his father Robert Blossfeld to Potsdam, who later offered seeds of this species in his seed list (seed catalog) as 'seed type 0264-Py/Paraguay, Chaco, Pirareta'…*".

The latter seed number is actually found in R. Blossfeld (1936: 36). These citations confirm that the Paraguayan seeds sold by R. Blossfeld came from A.M. Friedrich via O. Marsoner and H. Blossfeld. *Mediocactus hahnianus* may have been among this material. Hahn may have bought it from R. Blossfeld, and perhaps Backeberg got the plant in the 1950s — in any case, he saw the plant at Hahn nursery (Backeberg, 1959: 795). Although partially speculative, this scenario reconciles the various parts of the story of the European original material.

In his paper about *Harrisia hahniana* Myron Kimnach (1987) mentioned that the plant studied by him was coming from "another collection" of this species, grown from seed brought back to the US by the American botanist James West in March 1937. The material (seeds or cuttings) has been taken from a specimen cultivated at the botanic garden in Asunción (Paraguay), that had been collected by Teodoro Rojas at NE Paraguay, Río Apa region, at 200 m [erroneously "2000 m"], on a limestone formation (according to West cited by Kimnach 1987). The amazing feature of this disclosure is that T. Rojas was a close friend of A.M. Friedrich! They both shared trips in the Paraguayan Chaco, Rojas as a botanist and Friedrich as a photographer as well as plant and seed collector. They made some of these trips during the "Chaco War", as members of some government commission to gather documentation about this little-known area. References to that friendship are repeatedly found in Moser (1985) and are mentioned as well in the biography of Rojas (Schinini 2005), where Rojas' trips devoted to plant collections are listed. Kimnach mentioned seeds as the collected material. However, different information is found in the catalogue of plants found by West that is preserved at the University of California Botanical Garden. At entry "Cereanea n° 8498", it is written "Pl. only collected" which probably means that West brought back a living cutting to the US. This may eventually explain why there is a single US clone available.

After the first description has been published, the original material from Hahn's nursery apparently has not been widely distributed in cultivation and it is even probably lost; maybe it was also grown from a cutting because Backeberg (1962: 3653) wrote "*the **plant** should have been sent by Blossfeld jr. … to Hahn…*". The clone studied by Kimnach has been cultivated at the University of California Botanical Garden (Berkeley) since 1937 and since 1984 in Huntington Botanical Garden (San Marino, California), from where it has been generously propagated and distributed worldwide, by "International Succulent Introductions" in 1986 under the number ISI 1594 (HNT clone). Even, one of us had received a cutting of it some 30 years ago, from that institution, through the much appreciated and recently deceased Myron Kimnach. As a conclusion, it can be assumed that each *M. hahnianus* specimen in cultivation originates from the collection of T. Rojas, who found the plant in the mid-1930s (perhaps together with Friedrich) and brought it to the botanical garden in Asunción.

II. THE REDISCOVERY

When preparing the treatment of the Flora of Paraguay (unpublished), one of us (RK) noted the uncertainty about the origin of the plant, and the absence of recollection. Then, a trip to the junction of Río Apa with Río Paraguay had been organized in Sept. 2000, in a collaboration with several institutions (Facultad de Ciencias Químicas, Herbarium of the Universidad Nacional de Asunción [FCQ], Museo Nacional de Historia Natural del Paraguay [PY], Instituto de Botánica Darwinion [SI], and Jardin Botanique de Genève [G]). While the collection of herbarium samples from many plant families was surprisingly large, *M. hahnianus* could not be found. Probably it was overlooked during the collecting trip, or it does not grow in that area. Apparently, Rojas originally collected it more eastwards, perhaps in the Bella Vista area, some 150 km from there, where low sedimentary or calcareous hills also appear.

A few years ago (2009), Lidia Pérez de Molas found in the Paraguayan Chaco a cactus with a flower and a fruit — both hairy —, which might have been seen before without flower and thus confused with *Monvillea cavendishii*, which is widespread over all the area. Special attention was given to this plant, as the flower was very different from that of *M. cavendishii,* covered by long hairs, together with thin and more delicate stems and spines than in *M. cavendishii*. Having sent some photos to other authors (LO and RK), the plant was identified as *Harrisia hahniana* (as classified by Kimnach 1987). After that amazing finding, a special trip allowed us to find a colony of plants (Fig. 1) where we collected some small cuttings, which under cultivation freely produced a lot of new and long branches, as well as flowers. We suspect that the colony we found measuring about 20 to 30 meters in diameter, where very many broken stems had produced hundreds of individuals, all creeping and rooting, is a single clone. Searching around, no other colony has been found.

The stems (and later the flowers) of the new finding are in complete agreement with the clone studied by Kimnach (Fig. 2), and the excellent drawings he published in his 1987 paper, and with the illustrations we have seen, e.g. in Backeberg (1959: Abb. 713, 1962: Abb. 3320) and Hunt (2006: photo 235.2).

III. DISTRIBUTION AND ECOLOGY

The locality is situated in the dry woodland of the Chaco biogeographical region (Fig. 3), some 100 km before reaching Filadelfia coming from Asunción, in the Department Presidente Hayes. It is a few kilometers away from the Trans-Chaco route. The distribution area may be amazingly wider than expected, as the new discovery was made about 400 km SW of the original locality cited by Kimnach (1987), if Rojas' information given to West was accurate.

The cactus is growing under the shade of the dense xerophytic woodland, so that it does not get much sun. Winter is the dry season, and rains are frequent in summer, with an annual average of 700 mm, whereas the Río Apa zone where the first finding occurred has about 1200 mm/year (Metzing 1994). The soil is composed of alkaline, very thin clay (Esser 1982, Vogt 2011, and pers. obs.). In contradiction to Backeberg (1959), who characterized the plant as epiphytic, the notes accompanying the Rojas and West collection indicate that it grows as terrestrial (Kimnach 1987). The latter is confirmed by the rediscovery.

The associated vegetation at this locality is composed mainly of *Achatocarpus praecox*, *Aspidosperma quebracho-blanco*, *Aspidosperma triternatum*, *Trithrinax schizophylla*, *Tabebuia nodosa*, *Ceiba chodatii*, *Anisocapparis speciosa*, *Capparicordis tweediana*, *Cynophalla retusa*, *Maytenus vitis-idaea*, *Acanthosyris falcata*, *Libidibia paraguariensis*, *Prosopis kuntzei*, *Prosopis ruscifolia*, *Prosopis sericantha*, *Bougainvillea praecox*, *Pisonia zapallo*, *Salta triflora*, *Sarcomphalus mistol* and *Castela coccinea*. Other cacti there are *Cereus forbesii*, *Cleistocactus baumannii*, *Echinopsis rhodotricha*, *Harrisia bonplandii*, *Monvillea cavendishii*, *Monvillea spegazzinii*, *Opuntia anacantha* var. *retrorsa*, *Opuntia discolor* and *Stetsonia coryne*.

IV. TAXONOMIC RELATIONSHIP AND CLASSIFICATION

Backeberg originally placed the species in the genus *Mediocactus*, due to its pendent habit (Backeberg 1959: 795). Later Backeberg (1962: 3653) confirmed this classification and justified this with the only slightly tubercled fruits, the habit and the origin from Paraguay. But he also mentioned the separate position of the species, due to the similarly spiny and hairy flowers in *Selenicereus*, which are not so slender or long.

Kimnach (1987) also pointed to the similarity of flowers and fruits of *M. hahnianus* and *Selenicereus*, although the latter genus "*is not known southern of Venezuela and Colombia*".

Wallace (1997) used the same material of *M. hahnianus* from the Huntington Botanical Garden to study the species' phylogenetic position by the chloroplast marker *rpl16.* He deduced that the plant is an element of the genus *Echinopsis* (s. l., including *Trichocereus*) and published the corresponding combination *Echinopsis hahniana*.

In a later phylogenic study, using four molecular chloroplast markers, Schlumpberger & Renner (2012) grouped *E. hahniana* together with *E. schickendantzii* and *E. thelegonoides* in the *Helianthocereus* clade. The formal combination was published in the same year as *Soehrensia hahniana* (Schlumpberger 2012), as the genus name *Soehrensia* has priority over *Helianthocereus*.

Franck et al. (2013), using a combined matrix (two chloroplast and two nuclear markers), con-

Figure 1. *Trichocereus hahnianus* as rediscovered in the wild. Top left, many rooted stems together with a *Bromelia* sp. (the coin is 23 mm in diameter). Top right: flower bud. Middle left: full fruit. Middle right: fruit cut transversely (fruit not collected; seed maturity unknown). Bottom: flower. Picture, \\s L.P. de Molas except top right, R. Kiesling.

Figure 2. Top: left pot, new *Trichocereus hahnianus* finding; right pot, *T. hahnianus,* HNT clone. Note the small hairy flower buds towards the tip of the stems; both plants grown in the greenhouse under the same sun light conditions. Scale: 7 × 7 cm square pots. Collection and picture, D. Schweich. Bottom: comparison of the flowers: left new clone (cultivated by R. Kiesling), right: HNT clone (cultivated by A. de Barmon).

firmed the close relationship to *Echinopsis schickendantzii*. Further related species of that clade are *Echinopsis thelegona*, *E. camarguensis*, and *E. bridgesii*, all species from the Eastern Andes of Argentina and Bolivia. The trees calculated on the basis of only one single marker showed in principle similar relationships as those of the two plastid markers (*atpB-rbcL* and *rpl16*).

In a phylogenetic analysis of both morphological data and noncoding DNA sequence data (plastid markers *trnL-F* and *rpl16*) Albesiano & Terrazas (2012) came to a rather different conclusion: *Harrisia hahniana* turned out to be sister of *Harrisia earlei* in both analyses of the morphological and combined datasets, but sister to *Echinopsis ancistrophora* in the molecular two-marker data set. They approved the placement of *H. hahniana* (and *H. earlei*) in *Trichocereus*.

Guiggi (2012), without any explanation, but probably based on the analyses mentioned above, combined the species under *Trichocereus* as *T. hahnianus* (a combination unnecessarily repeated a few months later by Lodé 2013).

The generic position is uncertain if only morphological information is used. Kimnach (1987) remarked "*There is no question that this has been a*

Figure 3. Typical woodland where *Trichocereus hahnianus* has been found.

difficult species to place generically", a circumstance already mentioned by Backeberg (1962) and true up to now, in spite of the great advances in scientific methods and knowledge. The stems resemble an *Aporocactus*, or some *Selenicereus*, although both are epiphytic and not terrestrial as *M. hahnianus* is. The flowers resemble *Echinopsis* more than *Trichocereus*, because the tube is thinner than the pericarpel and has only sparse hairs, although the buds are very hairy. The fruit is similar to that of *Trichocereus* because of the dense hair cover when young and the thick wall. Kimnach (1987) saw a similarity between the seeds of *M. hahnianus* and those of the genus *Harrisia*. According to our own observations, however, the seeds of *M. hahnianus* are much smaller than those of *Harrisia* and they don't have the cavernous hilum-micropylar-region typical for *Harrisia* seeds. The size of the seeds is comparable with the seeds of *Trichocereus*, but otherwise the similarity with the examined seeds of several *Trichocereus* species is not very high.

DNA analyses (Wallace 1997, Schlumpberger & Renner 2012, Albesiano & Terrazas 2012, Franck 2013) suggest that *Mediocactus hahnianus* belongs to the large and polyphyletic *Echinopsis* genus *sensu lato*, but the authors suggest using either *Echinopsis*, *Trichocereus* or *Soehrensia* as the genus name. We chose *Trichocereus* in the broad sense, i.e., based on morphological characters and including large columnar plants as well as small and low growing plants. *Soehrensia* is an alternative suggested by DNA studies, but the flower size (at least) clearly conflicts the early diagnosis of Backeberg (1938). History and scientific progress will judge whether our choice is relevant or not, whereas the plants will remain unchanged.

The chromosome number of the new clone is already established with 2n = 22 (Las Peñas 2018). The relation of this species with some others (*Echinopsis thelegona*, *E. camarguensis*, *E. bridgesii, E. vasquezii and E. arboricola*, all with the same chromosome number 2n = 22; Las Peñas 2018) has been suggested by Franck et al. (2013).

V. NOMENCLATURE AND DESCRIPTION

Mediocactus hahnianus has been described with a short Latin diagnosis (only 2.5 lines) by Backeberg (1957), in order to validate novelties before the publication of his six-volume-monograph "Die Cactaceae" (Backeberg 1958–1962). In addition to the first description Backeberg (1959: 798) published a German translation with minor variants and very few details about the stem, but nothing about the flower and fruit, together with a picture of a (grafted) plant. More details were given by Backeberg (1962: 3653–3654), where he described the flower in detail, the fruit and briefly the seeds, and added a photo of the

same specimen as in 1959, but with flowers, another photo with a dry flower, and one more with a hardly recognizable fruit. The flower photos were taken by Hahn's nephew Dieter Schneider, who had taken over the nursery after Hahn's death in 1954.

The epithet "hahnianus" was chosen after the horticulturist Adolph Hahn from Berlin, in whose nursery Backeberg had seen the plant (Backeberg 1959: 795).

Trichocereus hahnianus (Backeb.) Guiggi, *Cactology* 3 (Suppl. II): 5. 2012. Basionym: *Mediocactus hahnianus* Backeb., *Descr. Cact. Nov.*: 10. 1957.

≡ *Harrisia hahniana* (Backeb.) Kimnach & Hutchison, *Cact. Succ. J. (Los Angeles)* 59: 59. 1987

≡ *Echinopsis hahniana* (Backeb.) R.S. Wallace, *Cactaceae Consensus Init.* 4: 12. 1997.

≡ *Soehrensia hahniana* (Backeb.) Schlumpb., *Cactaceae Syst. Init.* 28: 31. 2012.

= *Selenicereus paraguayensis* Hutch. ex Kimnach 1960. Nom. nud. (The name has been used on a herbarium label, only).

For types and other studied material see below.

Plant creeping, literally covering the soil, rooting when in contact with it. **Stems** fragile, cylindrical, not articulated, ca. 1.5–2.0 (–3.0) cm diameter, indefinite growth, up to 1 m long when pendent, branching from the base or lateral when injured, ca. 8 very low ribs when dehydrated, or tubercles slightly discernible when hydrated, **epidermis** fresh bright green, to dark, opaque green when grown at sunny places. **Areoles** at the edge of the ribs or on the center of the tubercles, felted and sporadically with some isolated long hairs. **Spines** thin, acicular (= needle shaped), very pungent, 8–14, whitish or yellowish or light-brownish-red when growing, 1 (–3) **centrals** rather porrect, 0.5–0.8 cm long, the others almost adpressed shorter, 0.3–0.8 cm long, when at full sun more differentiated, the central stronger, up to 1.0–2.5 cm long, **radials** 0.5 cm long.

Bud very woolly. **Flowers** nocturnal, from the young parts of the stems, 15.5–17.0 cm long, remaining open until the next morning and even the full day in overcast weather, delicate and fleeting smell of jasmine, at the anthesis funnelform or even rotate when fully open, 11.5–12.0 cm diameter; **pericarpel** slightly thicker than the tube; **tube** thin, ca. 1 cm diameter, with sparse adpressed scales, triangular and short at the base, lanceolate and longer near the throat, green to brown, with some white to brownish bristles up to 7 mm long and many whitish or brownish hairs, dense on the pericarpel, sparse on the tube. **Sepaloid tepals** green, narrow, acute; inner tepals pure white, obovate-oblong, acute, wide open at anthesis. **Ovary chamber** nearly globular 7–9 mm diameter. **Stamens** longer than the open perianth, with pale green base, whitish above, in two series, one along the tube 4–6 cm long, others at its upper part, shorter, in a single ring, anthers yellowish. **Style** cylindrical, whitish, ending in a yellowish or cream stigma 8–12-lobed. **Fruit** ovoid, longitudinally dehiscent, 32 mm long, 23 mm thick, with small (1.0–2.5 mm long) scales, **epidermis** smooth, shiny, green, covered by hairs, keeping or not the dried floral remains.

Seeds broadly obovate, blackish-brown, 1.25–1.50 mm long, ca. 1 mm wide and 0.75 mm thick, **periphery** slightly keeled, cells gradually smaller towards hilum, isodiametric, **anticlinal boundaries** channeled, straight; **interstices** cratered, **relief** convex, **convexities** low-domed, cuticle not or only weakly striate, **hilum-micropylar-region** oval, oblique, directed at ca. 45 ° from main seed-axis, more or less curved, slightly sunken, bright, **hilum** and **micropylar pores** conspicuously separated.

Note: We have observed that in full sun the stems can reach up to 3 cm in diameter (Fig. 5). The seeds described by him are in coincidence with those obtained by A. de Barmon crossing the HNT clone (ISI 1594) of *T. hahnianus* with pollen of *Echinopsis calochlora*. The thin spines, 2–7 mm long at the pericarpel and 1–4 mm long at the fruit, mentioned by Kimnach, have not been observed at our material. The presence or absence and the different sizes of the bristles may be due to the development of individual flowers or fruits. The bristle size may have been observed by Kimnach on different specimens. Normally, the shorter bristles are found on flowers and the longer on fruits due they grow along maturation (accrescence).

VI. TYPIFICATION

The species was described by Backeberg (1957), based on a plant in Hahn's nursery (Backeberg 1959: 795, 1962: 3653), but no type was designated by him. No plants or herbarium material from the original collection have remained, at least such are not known. The only material that could be considered as original material according to the Code (ICN Art 9.4; Turland, Wiersema, 2018) is the photo in Backeberg (1959: 798). Although Backeberg (1957) didn't cite the illustration, it is possible that the photo was made by him prior to, or at the time of, preparation of the diagnosis in the end of 1956. It is not clear from the text in Backeberg (1959: 795), whether he made the photo in the nursery of Dieter Schneider (that would mean in or after 1954) or already, when A. Hahn still was living. But it is likely that Backeberg had the necessary documentation together for the descriptions published in 1959 when he preferred to publish the diagnosis already earlier (Backeberg 1957). This concerns the typification now: If the photo is (the only known) element of the original material, it would have to be designated as lectotype. If not, a neotype has to be chosen. Since we can neither prove the one nor the other possibility, and since the original photo, which could perhaps give information about it, is not preserved, we consider it right to fix the name by a neotype.

Already Kimnach (1987) intended to designate a neotype, but he failed when he cited more than one herbarium specimen at HNT, MO and US (ICN Art. 8.1), and contradicted Art. 8.2 (cf. Ex. 3) since the three specimens have been prepared at different times, irrespective of whether the material had been taken from the same, single clone in cultivation.

To validate the typification and to follow the intention of Kimnach as well the inscriptions at the herbarium specimens, we formally designate the neotype:

Neotype (designated here): ***Harrisia hahniana*** (*Mediocactus hahnianus*); Paraguay, Rio Apa region, *Rojas and West 8499*, prep. ex cult. UCBG 37.1164-1 [by Kimnach] September 1976 (HNT 01738, photo seen). See Fig. 4. **Isoneotypes:** (F 1793761, seen; K 000100013, photo seen at: https://apps.kew.org/herbcat/getImage.do?imageBarcode=K000100013).

Other studied material:

Mediocactus hahnianus; Paraguay, Rio Apa region, *J. West 8499*, prep. ex cult. [by Kimnach] August 12, 1953 (US 2756219, photo seen). https://collections.nmnh.si.edu/search/botany/?ti=3 (as *Mediocactus hahnianus*). Labeled as neotype.

Parodia sp.; Paraguay. Zwischen Rio Apa und Rio Aquidaban 1908/1909. *K. Fiebrig 5318a*, dated 1910, July 29. (K 000100014). Note: It consists of a small piece of a stem that apparently comes from *T. hahnianus*; and a flower that perhaps belongs to *Frailea* sp. Later labeled "*Echinopsis hahniana* (Backeb.) R. Wallace" by N.P. Taylor in 2000. (https://apps.kew.org/herbcat/getImage.do?imageBarcode=K000100014)

Selenicereus hahnianus; Paraguay, Rio Apa region, xerophytic. Limestone formation. 200 m? March 11, 1937. *T. Rojas & J. West 8499*, prep. ex cult. [by P. Hutchison] Oct. 1952. (UC 1408638). (https://webapps.cspace.berkeley.edu/ucjeps/imageserver/blobs/b33a53bd-a0c4-484e-a990/derivatives/OriginalJpeg/content)

Echinopsis hahniana; Paraguay, Rio Apa. Grown at Lake Sarasota. Florida, obtained from Mesa Garden, Belen, New Mexico, International Succulent Introduction 1594. *A. R. Franck 2645*. 13 Jun. 2011 (USF). (http://swbiodiversity.org/seinet/collections/individual/index.php?occid=19301579)

Echinopsis hahniana; USA, Sarasota Co., Lake Sarasota; cultivated, stem pendent. 6 August 2013, *A.R. Franck 3266* (USF). (http://swbiodiversity.org/seinet/collections/individual/index.php?occid=19366667)

VII. *TRICHOCEREUS HAHNIANUS* IN CULTIVATION

Upon cultivation, the cuttings collected by us in Paraguay immediately gave lateral roots, and grew fast. After some months, in summer, the plants freely produced several flowers but repeated hand-made pollination failed to produce fruits, confirming our impression that the cuttings are surely from a single clone, even though some had been collected at opposite sides of the population.

Some cuttings cultivated at more sunny places attracted our attention: they became thicker, and produced rigid, longer and unequal spines, more similar to some specimens of *Monvillea cavendishii* (Fig. 5). This similarity may explain why we failed to identify at the field other specimens which were probably confused with *M. cavendishii* when the hairy or non-hairy flowers are not seen.

A. de Barmon got seeds from the HNT clone pollinated with *Echinopsis calochlora*. Fruit development required much watering, and maturation was longer than in *Echinopsis*. Seeds were ripe within two months from pollination, but the fruit split in the next spring after watering was resumed. A ripe fruit has been obtained with viable seeds, which have given seedlings that are similar to the HNT clone. We don't know however whether the seeds resulted from a true pollination or from a pollinic stimulation by *E. calochlora* (Fig. 6). The seeds are also similar to those described by Kimnach (Fig. 7).

Crossing the new and the HNT clones has been attempted several times but it was unsuccessful until September 23rd, 2019. A fruit has developed and is still stuck to the stem on November 11th, whereas non-fertilized flowers dry and quickly fall off together with the pericarpel. We will see later whether the seeds are viable or not. Nevertheless, further studies are necessary to understand the pollination biology of *T. hahnianus.*

VIII. OUTLOOK

Presently, there are two documented clones: 1) the clone from the Huntington Botanical Garden that has been used by Kimnach for his studies and neotypification; 2) the new clone collected by us in Paraguay (*Kiesling et al. 10536c*). We will continue to cross-pollinate the two clones in order to get fruits and seeds. These as well as further plant material obtained from sowing have to be compared with the published data. In addition we will compare their morphology, cytology and DNA characters with putative related or morphologically similar species (*Echinopsis serpentina,* Lowry & Mendoza 2011, from the border between Bolivia [La Paz] and Peru [Puno], in the Amazonian forest, a plant with very similar habit and flowers, as well with *Trichocereus arboricola* Kimnach and *T. vasquezii* Rausch).

The two well-identified clones are cultivated in the Systematics, Evolution and Cytogenetics Laboratory of Cactaceae (IMBIV-CONICET-UNC). Molecular phylogeny studies will be done to ascertain the position of this new clones within the phylogenies published by Schlumpberger & Renner (2012) and Franck et al. (2013), using the same markers and others frequently used in these studies. Furthermore, cytogenetical and morphological characters will be mapped.

Figure 4. The designated neotype of *Mediocactus hahnianus*.

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Figure 5. Left: comparison between the new *Trichocereus hahnianus* clone grown in full sun (left stem) and in the shade (right stem). Right: *Monvillea cavendishii* with the typical naked flower; the stem is thicker and spinier than *T. hahnianus*. However, without flower or fruit (red in *M. cavendishii*) the two plants can easily be confused.

Figure 6. Left: longitudinally dehiscent fruit; top: HNT clone; bottom: new clone. Both clones pollinated with *E. calochlora*. Only the HNT clone has given viable seeds. Right: seedlings obtained from the HNT clone pollinated with *E. calochlora*; 55 mm high, 18 mm in diam., 7 ribs, 9 months old. Cultivation and pictures, A. de Barmon

Figure 7. Comparison between hybrid seeds from the HNT (ISI 1594) clone × *E. calochlora* and Kimnach (1987) seed drawing (slightly adapted to fit the size of the photos). The black horizontal bar is 1 mm long. Photos: D. Metzing.

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