

## *Raphionacme haeneliae* (Periplocaceae), a new species from the Namib Desert, Namibia

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*Raphionacme haeneliae* Venter & Verhoeven, a new species collected in the Namib Naukluft Park, Namibia, is described and illustrated. A map with its present known distribution is provided. *R. haeneliae* reveals affinity with *R. lanceolata* Schinz in the spreading, much-branched plants, large ovate foliage leaves and corona lobes that are basally unsegmented. *R. haeneliae* is distinguished by its lemon-green and pink corolla lobes, long filiform corona lobes and paired pincer-like follicles.

**Keywords:** Africa, Namibia, Periplocaceae, *Raphionacme haeneliae*, sp. nov., taxonomy.

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### Introduction

*Raphionacme* Harv., with 38 species, is the largest genus in the Periplocaceae and is endemic to Africa, one species from Arabia being the exception. All the *Raphionacme* species are herbaceous geophytes, most are erect, and a small number are climbers or prostrate plants. The majority of the species inhabit grassland and savanna but a few are found in swamps, and a number occur in semi-desert regions. *R. haeneliae* is the only true desert species in the genus.

The *Raphionacme* species are distributed widely over Africa with the highest concentration in the tropical grassland and savanna biomes of southern Africa. Namibia possesses five species, *R. haeneliae* Venter & Verhoeven sp. nov., *R. inconspicua* H. Huber, *R. lanceolata* Schinz, *R. namibiana* Venter & Verhoeven and *R. velutina* Schltr. Except for *R. haeneliae*, these species all occur in savanna and semi-desert scrub.

*R. haeneliae* was first collected by E.R. Robinson in 1972. He collected two specimens, on the 3rd and 16th of April respectively. He found the plants in the Namib Naukluft Park south of Mirabib in the vicinity of the Hope Mine and identified them as '*Raphionacme* sp.' This material was sterile, but the tubers indicated that it was a *Raphionacme*. The first author located these specimens in the early 1980s in the Herbarium of the University of Fort Hare. Since then we have searched for the species at various occasions in the Namib Naukluft Park, but to no avail. In 1994, 22 years after Robinson's find, an official at Gobabeb Research Station in the Namib Desert, Ms Christine Hänel, found the plant again at Hope Mine and Thomasberg. A number of plants were sprouting, some in full bloom, and others fruiting after good rain had fallen in the late summer of 1993/94.

Ms Hänel's specimens reached us in 1995 and we recognized them as being similar to those collected by Robinson in 1972. We realized that they belonged to a new species which we named after Christine Hänel.

### Materials and Methods

The external morphology of the species was studied from herbarium specimens using a Zeiss Stereo Microscope. Pollen was obtained from specimen C. Hänel, 6 September 1994 (WIND) and acetolysed according to the method of Erdtman (1960), mounted in glycerine jelly and sealed with paraffin wax for study with the light microscope, when all measurements were made. For scanning electron microscopy, pollen was acetolysed, air-dried on stubs, coated with gold and examined with a Jeol Winsem 6400 microscope. Translators from the same specimen were mounted on stubs with double-sided tape, coated with gold and also examined under this microscope.

### Pollen analysis

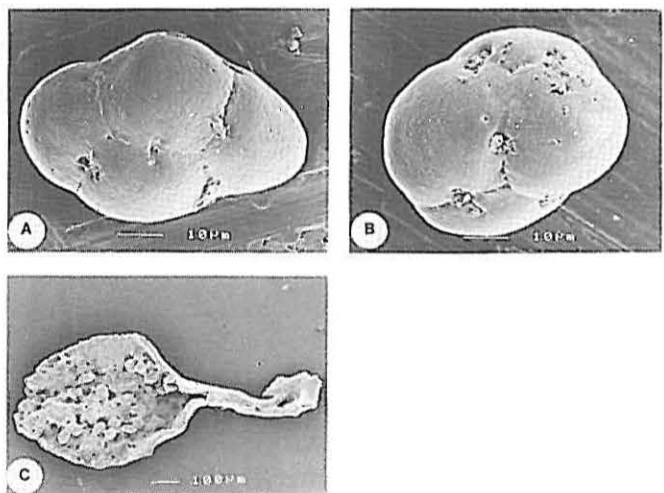
The pollen grains were united in tetrads with the grains arranged rhomboidally or decussately (Figure 1A & B). The rhomboidal tetrad size ranged from 61.4–86.5  $\mu\text{m}$  with an average of 76.5 ( $\pm 7$ )  $\mu\text{m}$  in length, and 46.5–63.2  $\mu\text{m}$  with an average of 53.8 ( $\pm 4.5$ )  $\mu\text{m}$  in width. Six pores occurred per grain. Pores were round to elliptical, varying from 1.4–4.7  $\mu\text{m}$  in diameter and the exine was smooth. The pollen of *R. haeneliae* is therefore similar to that found in the other species of *Raphionacme*. The rhomboidal tetrad size (76.5  $\times$  53.8  $\mu\text{m}$ ) of *R. haeneliae* corresponds to that of *R. lanceolata* (69.3  $\times$  61.6  $\mu\text{m}$ ), a closely related species (Verhoeven & Venter 1988).

### Description

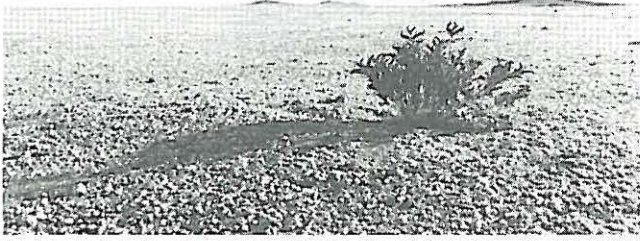
*Raphionacme haeneliae* Venter & Verhoeven, sp. nov.

Præbens affinitatem *R. lanceolatae* plantis multum ramosis, foliis magnis ovatis et lobis coronae non segmentatis. Planta distincta est corollae lobis citro-viribus atque roseis et coronae lobis longis filiformibus.

Herba geophyta. *Caulis* aërius erectus. *Folia* glabrata, lamina late vel anguste ovata, 50–60  $\times$  10–40 mm. *Inflorescentia* terminalis, ca. 5 monochasiis et floribus ca. 3. *Flores* actinomorphi, gynostegium exsertum ab ore corollae. *Corolla* 6 mm longa, glabrata; tubus cam-



**Figure 1** SEM micrographs of tetrads and translator of *Raphionacme haeneliae* [Hänel, C., 6 September 1994 (WIND)]. A. Rhomboidal tetrad; B. decussate tetrad; C. translator.

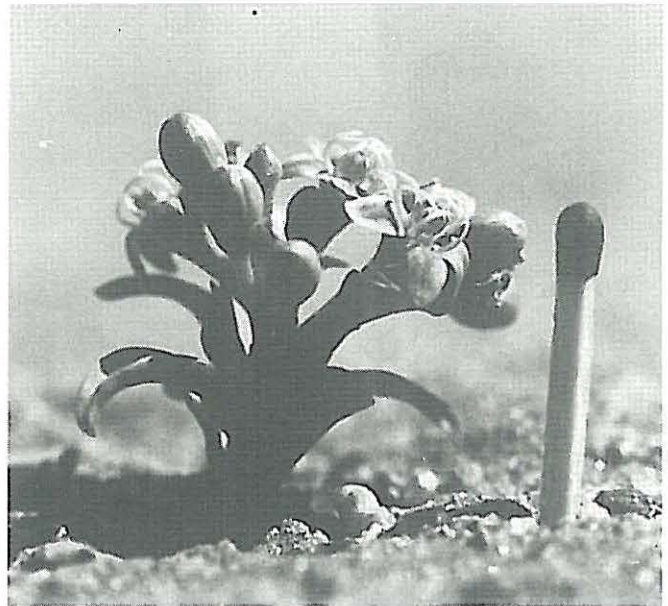


**Figure 2** A solitary plant of *Raphionacme haeneliae* on a gravel plain in the Namib Desert.

panulatus; lobi oblongo-ovati,  $4 \times 2$  mm, citro-virides et rosei. *Coronae* lobi 5, filiformes, citro-virides. *Stamina* e basi coronae exorientia, antherae ellipticae. *Ovaria* 2, capitulum stigmaticum pentangulare ovoideum, gerulus pollinis spatulatus. *Folliculi* late divergentes, linearivoidei,  $65-70 \times 5-6$  mm.

**HOLOTYPUS.**— Namibia, Namib Naukluft Park, Thomasberg, C. Hänel, 4 March 1994 (K).

A geophytic, glabrous, lactiferous herb up to 0.4 m tall. *Roots* with few to numerous subterrestrial tubers; tubers cylindrical, succulent with watery sap. *Underground stems* from crown of main tuber, perennial, erect, up to 250 mm long. *Aerial stems* seasonal, one to few arising from the underground stems, erect and spreading, branched, up to 0.4 m long and 4–7 mm in diameter, succulent-herbaceous. *Leaves* opposite or sub-opposite, simple, succulent; petiole 1–3 mm long, no interpetiolar lines, ridges or colleters; blade broadly to narrowly ovate,  $50-60 \times 10-40$  mm, bluish-green to dark green, with thick waxy cuticle, lateral veins arching towards apex, margin entire, undulate, apex recurvate, rounded, acute or acuminate, base rounded. *Inflorescences*



**Figure 4** Flowers of *Raphionacme haeneliae* are the first parts of the plant to appear above ground level.

appearing before leaves, terminal, cymose with *ca.* 5 monochasial branches, each with *ca.* 3 flowers; peduncles 3–5 mm long; pedicels 2–3 mm long; bracts ovate, 1–2 mm long, apex acute and mucronate. *Flowers* actinomorphic, pentamerous, gynostegium exerted from corolla mouth. *Sepals* free, broadly ovate,  $2 \times 1.5$  mm, green, apex acute and mucronate. *Corolla* 6 mm long; tube campanulate, 2 mm long, inside vertically fluted between stamens, each flute terminating in glandular pocket at base of tube; lobes spreading, oblong-ovate,  $4 \times 2$  mm, abaxially lemon-green, adaxially lemon-green flushed pink in centre, apex rounded. *Corona* inserted in corolla mouth; lobes 5, distinct, antisepalous, filiform with base dilated, 4–5 mm long, lemon-green, apex tortuous. *Stamens* arising from inner face of corona base; filaments filiform, 1 mm long; anthers fused to stigmatic



**Figure 3** An enlarged flower of *Raphionacme haeneliae* showing the filiform corona lobes and gynostegium in the centre.

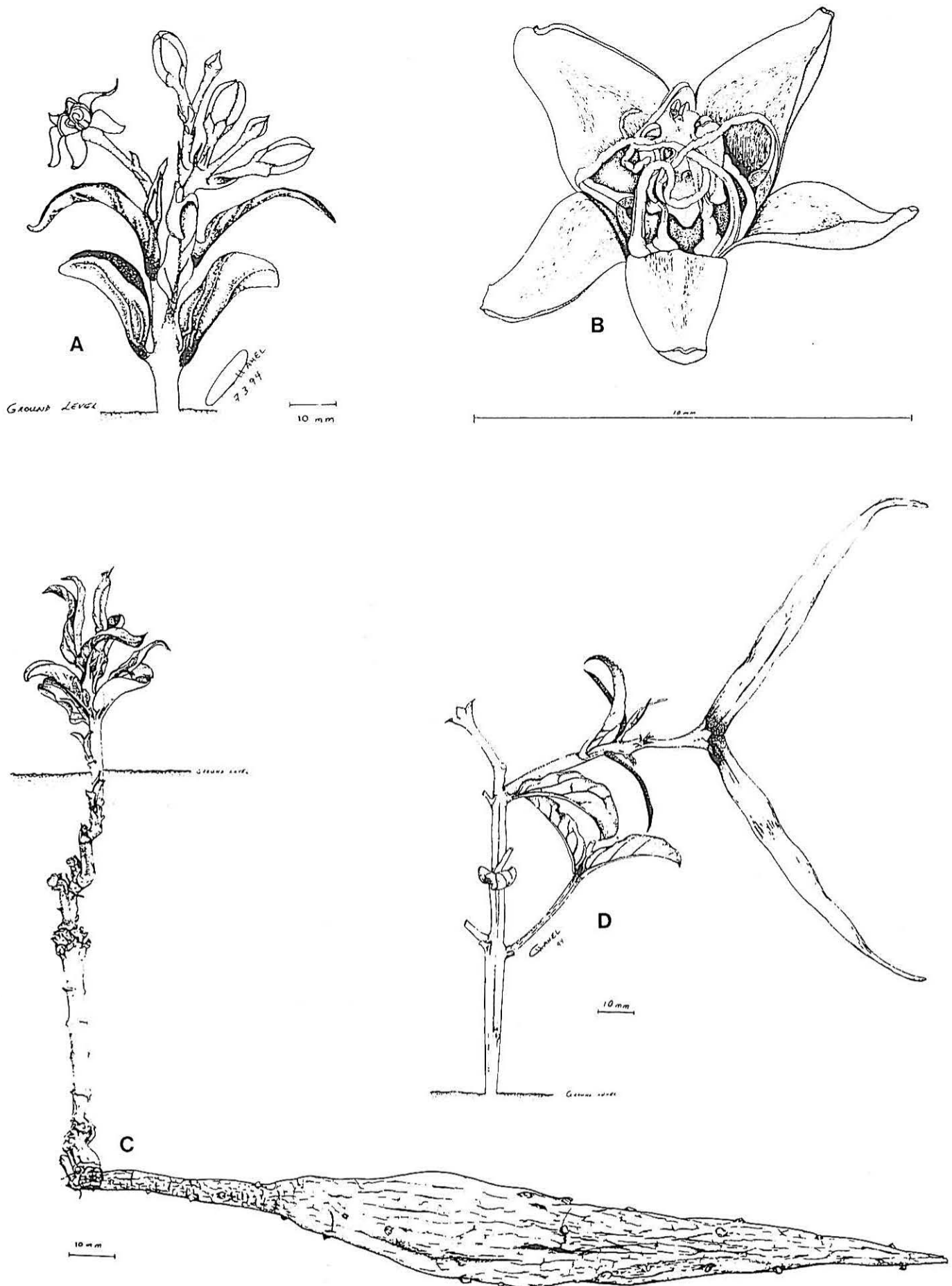


Figure 5 *Raphionacme haeneliae*. A. Stem with leaves and flowers; B. flower enlarged showing the filiform corona lobes and central gyno-stegium; C. plant with subterranean root tuber and perennial stem; D. plant with pincer-shaped follicles.

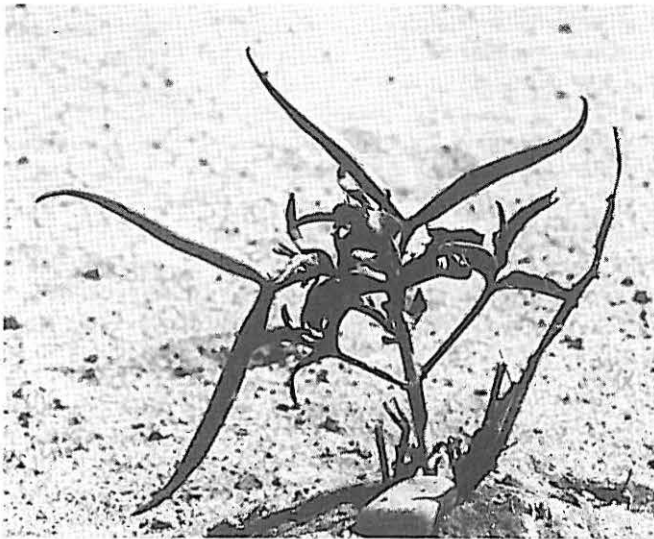


Figure 6 A plant of *Raphionacme haeneliae* with paired follicles.

head, elliptic, 1.5 × 0.5 mm, white; pollen in rhomboidal or decussate tetrads. *Ovaries* 2, semi-inferior, style terete, 1 mm long; stigmatic head broadly pentangular ovoid, 1.5 × 1.5 mm, apex acute, greenish, with 5 pollen translators alternating with anthers, translators spatulate, 2 mm long, receptacle broadly ovate, stipe filiform, viscidium concavely ellipsoid. *Follicles* paired, widely divergent, linear-ovoid with corniculate apex, 65–70 × 5–6 mm. *Seeds* oblong-elliptic and concave, 10 × 4 mm, surface striate-verrucose, brown; coma 12–15 mm long, whitish. (Figures 1–6).

**Distribution and ecology**

*R. haeneliae* is known from only two localities, both in the Namib Naukluft Park at an altitude of approximately 600–700 m. One is the Hope Mine south of Mirabib and the other Thomasberg near Ganab (Figure 7). The species probably has a wider distribution range over the Namib Desert, however, years may pass without any rain and the showers are so localized that the plant seldom appears above ground and is thus seldom seen. In spite of this, *R. haeneliae* is common when encountered. The species' habitat is whitish, deep sand or gravel in which its tubers are deeply hidden from the harsh conditions prevailing above ground. The general environment consists of endless plains and

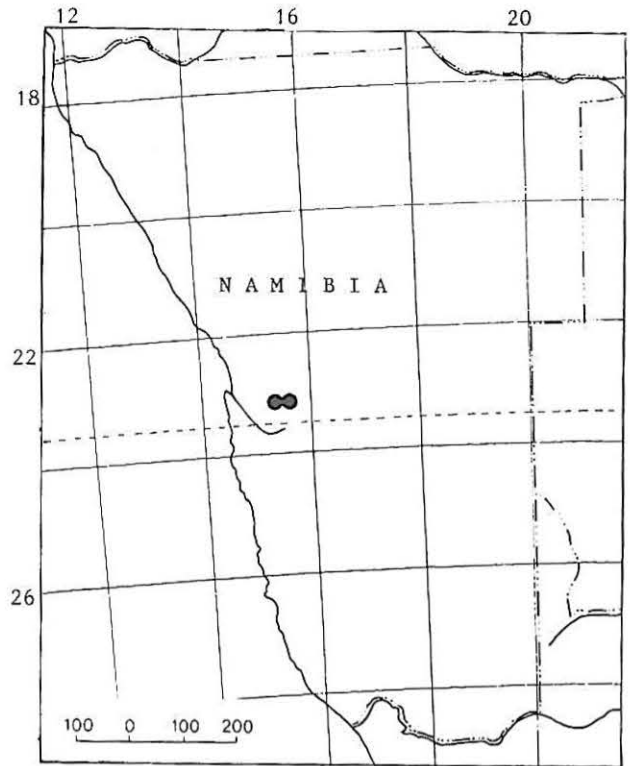


Figure 7 Present known distribution of *Raphionacme haeneliae*.

low dunes among widely dispersed granite hills and island mountains (Figure 2). These plains are devoid of any plants with perennial aerial parts. Only *Acacia erioloba* E. Mey. is encountered along sandy washes and the bases of the rocky hills and mountains.

**Discussion**

*R. haeneliae* is the only true desert species in the genus and has some unique characteristics. The other species of *Raphionacme* have a solitary root tuber, rarely a few, and these are mostly turnip-shaped. *R. haeneliae*, in contrast, has numerous cylindrical tubers per plant. Robinson, who collected the first specimens of this species, reported as many as 26 tubers on a plant, each weighing as much as 1 kg! These tubers were located about 0.25 m beneath the soil surface and radiated from the plant base. A well-developed root system was found above and below the tubers. Ms Hänel reported that the tubers branched off from the perennial subterrestrial stems.

Robinson further reported that the leaves of *R. haeneliae* were succulent, which is also unique in the genus and even in the family. The three species of *Ectadium* E. Mey. also grow under extreme desert conditions in the Namib, but they have coriaceous leaves (Venter *et al.* 1990). Species of genera such as *Periploca* L. and *Cryptolepis* R. Br., growing in semi-desert and desert environments in northern Africa and Arabia, have coriaceous leaves which are often much reduced or even absent, but never succulent.

*R. haeneliae*, *R. inconspicua*, *R. lanceolata* and *R. namibiana* reveal affinity. They are all erect to spreading plants with large broad leaves. The simple, basally entire corona lobes are also distinctive. Of these four species, *R. haeneliae* has the simplest corona lobe structure, which is filiform, entire and without any basal dilation. *R. haeneliae* differs from the other three species as indicated in Table 1.

Table 1 Comparison of *Raphionacme haeneliae* with *R. inconspicua*, *R. lanceolata* and *R. namibiana*

	<i>R. haeneliae</i>	<i>R. inconspicua</i>	<i>R. lanceolata</i>	<i>R. namibiana</i>
Tubers	numerous cylindrical	solitary, rapiform	solitary, rapiform	solitary, cylindrical
Corolla	lemon-green and pink	green?	green and violet	deep pink
Corona	filiform, base undilated, lemon-green	filiform, base dilated, violet?	ligulate and apex bifid, green-brown to green-violet	filiform, base dilated, whitish-pink
Follicles	paired, linear-ovoid,	?	mostly solitary, narrowly ovoid	solitary, keel-shaped ovoid
Seeds	hairy coma	?	hairy coma	hairy ring

### Specimens examined

Namibia:

—2315 (Rostock): Namib Naukluft Park, Hope Mine south of Mirabib (-AB), Hänel, C., 9 March 1994 (K, WIND), Robinson, E.R. S-R10 [2 sheets, dated 3 March 1972 (BLFU, UFH) and 16 April 1972 (UFH) respectively]; Namib Naukluft Park, Thomasberg (-BA), Hänel, C., 4 March 1994 (K), 8 April 1994 (WIND), 6 September 1994 (WIND), 4 October 1994 (WIND).

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