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Raphionacme villicorona (Apocynaceae: Periplocoideae), a new species from the Sekhukhuneland Centre of Plant Endemism, South Africa

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Abstract

A new species, *Raphionacme villicorona* Venter is described from the Sekhukhuneland Centre of Plant Endemism in the Limpopo Province, South Africa. It was discovered in dry mountain savanna of the northern Leolo Mountain range. *R. villicorona* belongs to a small group of *Raphionacme* species in which the gynostegium is elevated above the corolla mouth. The villous condition of the corona lobes is unique in the genus. An IUCN Red List status of VU D2 is recommended.

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1. Introduction

Other than the one Arabian species, *Raphionacme* Harv. is endemic to Africa. It is the largest genus in the sub-family, totaling 38 species, *Raphionacme villicorona* included. The majority of *Raphionacme* species are herbaceous suffrutescent geophytes from savanna and grassland. The largest concentration of species is found in southern and south-eastern Africa (Venter and Verhoeven, 1988).

R. villicorona belongs to a unique *Raphionacme splendens* group that includes *Raphionacme chimanimaniana* Venter and R.L.Verh., *Raphionacme kubangensis* S.Moore, *Raphionacme namibiana* Venter and R.L.Verh. and *R. splendens* Schltr. (= *Raphionacme excisa* Schltr.), in which the corona lobes are filiform from massive coronal feet and the gynostegia elevated above the corolla mouth on stilted filaments and styles.

When this plant was first brought to our attention by environmentalist Niels Jacobsen during the course of an environmental impact study in the area of the Leolo Mountain foothills, it was tentatively identified as *R. chimanimaniana*, which it closely resembles. During fieldwork we established the uniqueness of this rare species, and could thus explain the apparent incongruity

in habitat between eastern Zimbabwe and Sekhukhuneland. This is the first representative of this widespread African group within *Raphionacme* to be found in South Africa.

2. Materials and methods

The external morphology of the new species was studied with an Olympus Stereo Microscope from fresh material and rehydrated herbarium material. Pollen and translators were obtained from the herbarium specimen, *Winter 6899* (PRE). For light microscopy, pollen was acetolysed according to the method of Erdtmann (1960), mounted in glycerine jelly and sealed with paraffin wax. Measurements were made with a light microscope. For scanning electron microscopy (SEM), pollen was acetolysed, air-dried on stubs, coated with gold and examined with a Jeol Winsem 6400 microscope at 5 kV (Centre for Confocal and Electron Microscopy, University of the Free State). The translators were mounted on stubs with double-sided tape, coated with gold and examined with the same microscope. Translator measurements were done with the measurement facility of the SEM. Coronas were obtained from a flower (*Winter 6899*), rehydrated in 3% phosphate-buffered glutaraldehyde. The coronas were dehydrated in an alcohol series, critical point dried, mounted on stubs, coated with gold and examined with a Jeol Winsem 6400 scanning electron microscope.

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3. Results

3.1. Pollen and translators

The pollen grains of *R. villicorona* are united in tetrads with the grains arranged rhomboidally or decussately (Fig. 1a and b). The rhomboidal tetrads range in size from 70.7 to 94.8 μm with an average of $80.7 \pm 7.1 \mu\text{m}$ in length and $57.7\text{--}74.4 \mu\text{m}$ with an average of $65.9 \pm 5.1 \mu\text{m}$ in width. Individual tetrad grains have ten to sixteen pores. The pores are round, oval or irregular and are restricted to the junction area of adjacent grains. Pores are sometimes covered with a thin layer of exine material. The exine is smooth. The pollen morphology is typical of that of the other *Raphionacme* species (Verhoeven and Venter, 1988). The average rhomboidal pollen size of *R. chimanimaniana* ($83 \times 66 \mu\text{m}$) is very similar to that of *R. villicorona* ($81 \times 66 \mu\text{m}$). The rhomboidal pollen size of *R. namibiana* ($74 \times 65 \mu\text{m}$) and *R. splendens* ($71 \times 63 \mu\text{m}$) is slightly smaller than that of *R. villicorona* (Verhoeven and Venter, 1988).

The translators consist of three morphological parts, which form a functional unit (Fig. 1c). The three parts have been described under different names, for example the spoon as receptacle, shovel or translator, the stalk as stipe and the adhesive disc as viscidium (Verhoeven and Venter, 1997). The spoon in *R. villicorona* is elliptic in form and the stalk is rounded to u-shaped due to the flanks that curve inwards. The translators are 3.6–4.1 mm long. Morphologically the translator of *R. villicorona* is very similar to that of *R. chimanimaniana* and *R. splendens* (= *R. excisa* Schltr.) (Verhoeven and Venter, 1997), *R. kubangensis* (personal observation) and *R. namibiana* (Bruyns, 1994).

3.2. Description

R. villicorona Venter sp. nov. similis est *R. chimanimaniana*, *R. kubangensis*, *R. namibiana*, *R. splendens* respectu filiformium coronae loborum portatorum in solidis pedibus coronalibus et gynostegii elevati. *R. chimanimaniana* tamen habet flores magenteis vel albis corollis et columnaribus pedibus coronalibus glabris coronae lobis; *R. kubangensis* habet folia elliptica, multifloras inflorescentias et flores columnaribus pedibus coronalibus et glabris coronae lobis; *R. splendens* habet flores roseis vel purpureis vel caeruleis corollis, columnaribus pedibus coronalibus, glabris coronae lobis, costatis stylis pubescentibus; *R. namibiana* habet folia anguste ovata et cariniformes folliculos. *R. villicorona*, aliter ac quattuor species supra, habet folia linearia vel angustissime lanceolata, inflorescentias paucifloratas, flores corollis viridibus, pedibus coronae deltoidibus, lobis coronae villosis, teretibus stylibus glabris, cylindraceo-ovoideis folliculis.

TYPE.- South Africa, Limpopo, Sekhukhuneland, northern Leolo Mountain range, De Kamp 507 KS, 1 200 m, 12 November 2002, PJD Winter 5899 (PRE, holotype).

Erect suffrutescent herb with white latex, up to 0.3 m tall. *Tuber* narrowly ovoid with tapering base, ca. $0.2 \times 0.1 \text{ m}$. *Subterranean* stem from crown of tuber, perennial, erect, $50 \times 5 \text{ mm}$. *Aerial stems* solitary to few, erect, up to ca. $0.1 \text{ m} \times 2\text{--}3 \text{ mm}$, greenish-brown, puberulent to tomentose, interpetiolar ridges with reddish colleters. *Leaves* opposite, erect to spreading, subsessile; blade involute, linear to linear-lanceolate, $60\text{--}70 \times 2\text{--}3 \text{ mm}$, tomentose on both sides, greyish-green, main vein prominent, margin entire, apex acute, base long-tapering. *Inflorescences* terminal and sub-terminal, cymose-racemose, few-

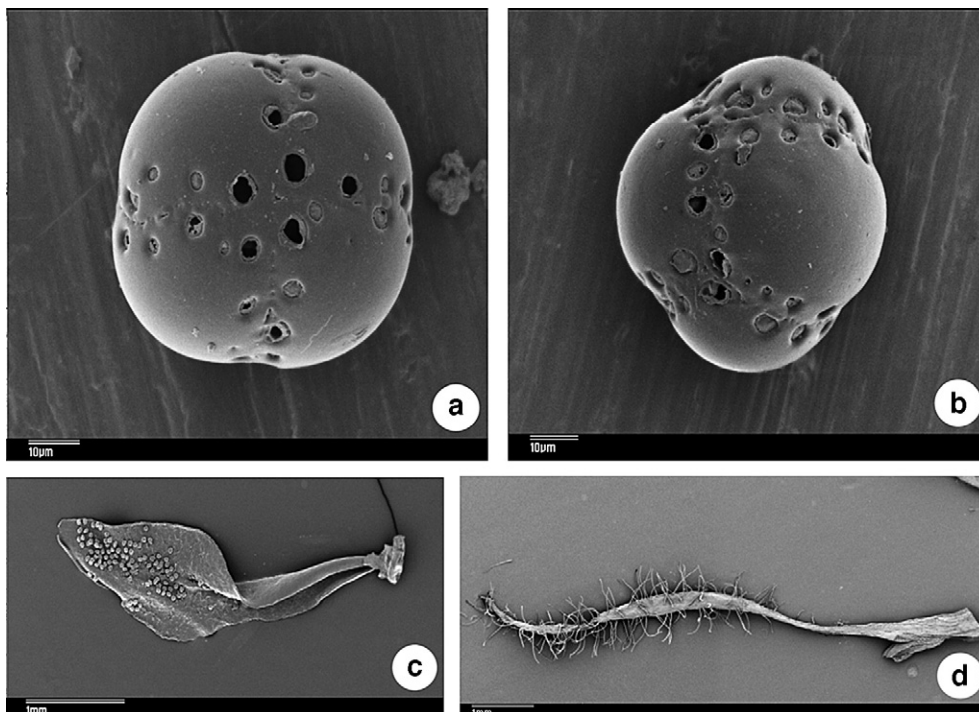


Fig. 1. *R. villicorona*: (a) rhomboidal tetrad, (b) decussate tetrad, (c) translator, (d) villous corona lobe. Scale bars: a, b = 10 μm , c, d = 1 mm (Winter 6899).

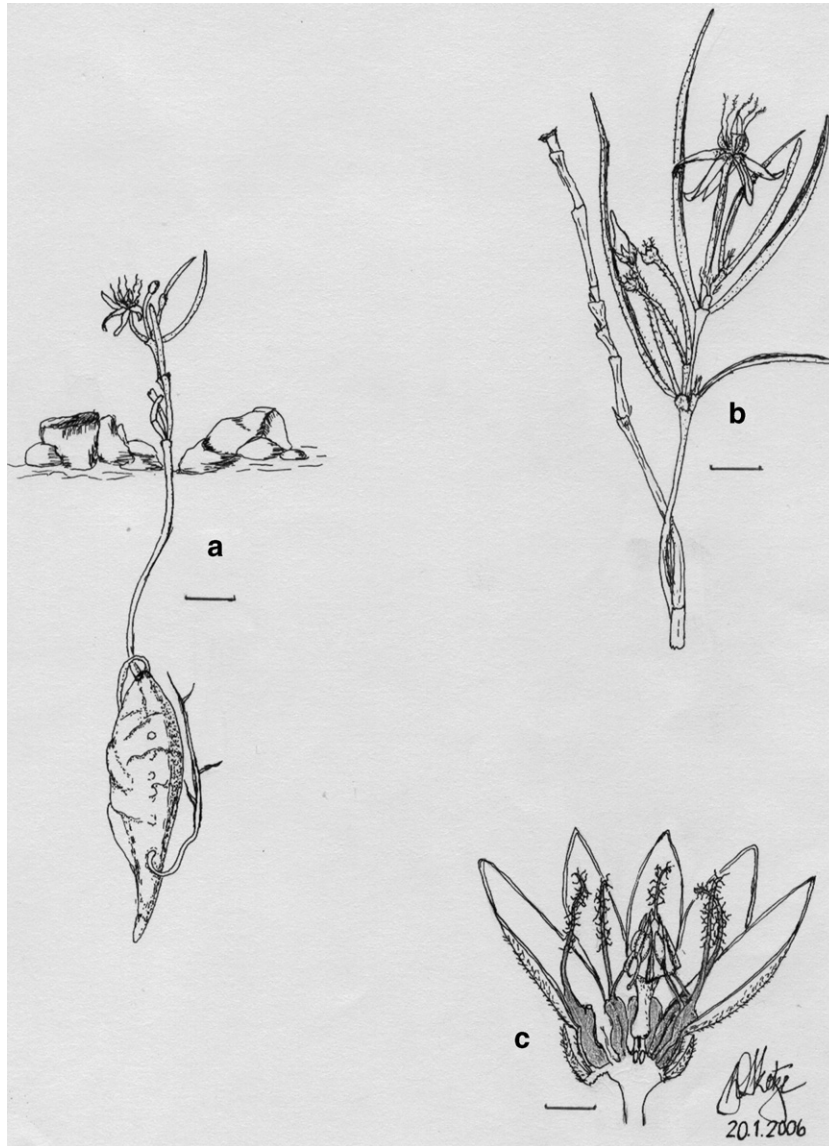


Fig. 2. *R. villicorona*: (a) plant habit, (b) stem with leaves, flower bud and open flower, (c) flower opened, showing corolla lobes, villous corona lobes, stamens and pistil. Scale bars: (a)=20 mm, (b)=10 mm and (c)=3 mm (Venter 9889 (photo), Winter 6899).

flowered, tomentose to velutinous; peduncles 1–5 mm long, pedicels 15–25 mm long, bracts opposite, acicular, 1–2 mm long. *Flowers* actinomorphic, 5-merous, gynostegium elevated above corolla mouth. *Sepals* free, narrowly triangular, 2–3 × 1 mm, tomentose. *Corolla*: outside tomentose, inside glabrous; tube broadly campanulate, 3–4 × 3 mm, inside maroon-violet, fluted, outside violet-green; lobes reflexed, linear to oblong-ovate, 13–15 × 2 mm, inside green with base maroon-violet, outside green, apex acute. *Corona*: arising from corolla tube mouth, coronal feet narrowly deltoid, ±3 mm long, free, maroon-violet; lobes from apices of coronal feet, filiform, 9–12 mm long, green, upper half villous. *Stamens*: filaments from inner face of coronal feet, filiform, 3–4 mm long, maroon-violet, exerted from corolla mouth; anthers narrowly triangular-ovate with attenuate apices, 3–4 mm long, creamy-white, free but basally fused to style-head, sub-erect, conniving over style-head; pollen in rhomboid or decussate tetrads, pollen grains 10–16-porate, smooth. *Nectaries* interstaminal at base of corolla

tube, pouch-like, dark green. *Ovaries* 2, semi-inferior, sub-ovoid, ca. 2 mm long, ovules numerous; style exerted from corolla mouth, 4–5 mm long, terete, maroon-violet, glabrous, glandular; style-head elevated above corolla mouth, narrowly angular-ovoid with blunt apex, 4 × 2 mm, maroon-violet; translators with receptacle elliptic, stalk rounded to u-shaped, viscidium sub-discoid. *Follicles* solitary, erect, cylindrically ovoid, apex attenuate, ca. 100 mm long. *Seeds* unknown (Figs. 1d, 2 and 3).

3.3. Diagnostic features and affinities

R. villicorona Venter sp. nov. resembles *R. chimanimaniana*, *R. kubangensis*, *R. namibiana* and *R. splendens* in its filiform corona lobes borne on massive coronal feet and in the elevated gynostegium. However, *R. chimanimaniana* has flowers with magenta to white corollas and columnar coronal feet with glabrous corona lobes; *R. kubangensis* has elliptic leaves, many-



Fig. 3. *R. villicorona* stem with flowers and leaves from the type specimen (photo by Winter PJD).

flowered inflorescences and flowers with columnar coronal feet and glabrous corona lobes; *R. splendens* has flowers with pink, purple or blue corollas, columnar coronal feet, glabrous corona lobes and ribbed, hairy styles; and *R. namibiana* has pink flowers, coronal feet sub-globose and laterally dilated with lobe subulate, narrowly ovate leaves and keel-shaped follicles. *R. villicorona*, in contrast to the above four species, has linear to very narrowly lanceolate leaves, few-flowered inflorescences, the flowers with green corollas, deltoid coronal feet, villous corona lobes, terete glabrous styles, and cylindrical-ovoid follicles.

3.4. Key to the species of the *R. splendens* group

- | | |
|---|--------------------------|
| 1. Corolla lobes on inside pale green to green, base may be violet | 2 |
| Corolla lobes on inside white, pink, magenta, purple or blueish | 3 |
| 2. Corona lobes glabrous | <i>R. kubangensis</i> |
| Corona lobes villous | <i>R. villicorona</i> |
| 3. Coronal feet sub-globose and laterally dilated, lobe from apex of coronal foot subulate, about half as long as corolla lobes; follicles stout and keelshaped | <i>R. namibiana</i> |
| Coronal feet columnar, lobe from apex of coronal foot filiform, about as long as or longer than the corolla lobes; follicles slender, cylindrically ovoid | 4 |
| 4. Style partly furrowed and hairy; corona lobes fused into a collar outside the stamens | <i>R. splendens</i> |
| Style terete, not furrowed, glabrous; corona lobes free from one another | <i>R. chimanimaniana</i> |

3.5. Distribution, habitat and conservation status

R. villicorona is apparently restricted to the Sekhukhuneland Centre of Plant Endemism (Van Wyk and Smith, 2001), in the Limpopo Province (Fig. 4). It occurs in the northern end of the Leolo Mountain range and satellite hills, at altitudes of 800–1300 m, in full sunlight. The vegetation of the northern Leolo range is typically a dry *Lydenburgia cassinoides*–*Kirkia wilmsii* savanna. Rainfall is 400–600 mm per annum and occurs mainly from summer to autumn. The climate is subtropical, with hot summers and dry, sunny winters with light frost and cool evenings. The substrate is a well-drained, stony or rocky, dark brown loam soil derived from gabbro-norite rocks of the main zone of the Rustenburg layered suite in the Bushveld Igneous Complex (Viljoen and Reimold, 1999).

The plants become dormant in winter, and resprout in late spring, often before the onset of the rainy season. Flowering seems to coincide with the onset of rains, though does not seem dependent thereon. Pollination and seed dispersal is unknown, but is probably similar to that of other species in this group.

R. villicorona is at present known from only three localities within an extent of occurrence of 54 km², of which one was threatened by extension of a platinum mine at the time when fieldwork was done. Siebert et al. (2002) and Victor and Venter (2002) recommended an IUCN Red List conservation status of VU D2 for *R. chimanimaniana*, which at that stage included the South African occurrence. Mapaire and Timberlake (2002), however, listed *R. chimanimaniana* as LR-lc in the Zimbabwean list. Because of a presumed likelihood of finding more localities (subpopulations) of *R. villicorona* in the immediate vicinity, we recommend that the Red List status remains as VU D2, but it should be noted that the observed (global) population

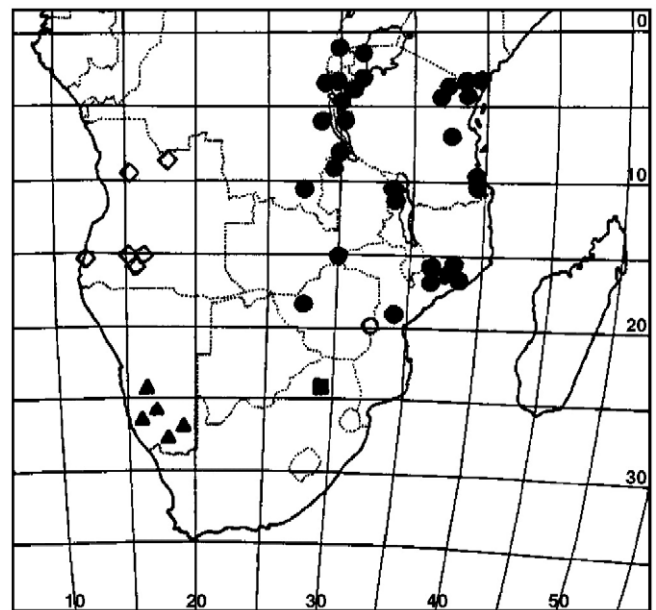


Fig. 4. Known distribution of *R. villicorona* (■), *R. chimanimaniana* (○), *R. kubangensis* (◇), *R. namibiana* (▲), and *R. splendens* (●) in Africa, south of the equator. Note that the range of *R. splendens* north of the equator is not shown here.

size is currently only in the order of 20 mature individuals. The Red List status of *R. chimanimaniana* is now in need of review, preferably based on fieldwork.

The group of species to which *R. villicorona* belongs is spread over southern Africa (Fig. 4), except for *R. splendens* that extends far north of the equator into the Sudan and west as far as Senegal. They are all components of savanna ranging from moderately moist to very dry.

3.6. Specimens and photos studied

24S29E (Zebediela): Sekhukhuneland dist, Leolo Mountain foothills, farm Zeekoegat 421 KS (-BD), 1999, Jacobsen s.n. (PRE); 29 October 2002, *Venter 9889* (BLFU; photos); Northern Leolo Mountains, farm Himalaya 463 KS (-BD), 27 October 2002, *Winter 5861* (PRE, photo); Northern Leolo Mountains, farm De Kamp 507 KS (-BD), 12 November 2002, *Winter 5899* (PRE).

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locality. Janine Victor advised us in proposing the conservation status. The University of the North provided transport for one of us. SRK Consulting arranged transport and access to the site as part of their EMPR study, funded by Anglo Platinum. Lebowa Platinum Mines Ltd and Victor Molapo are thanked for providing access.

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