

Pelargonium quarcticola (Geraniaceae), a new species from the Knersvlakte

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Pelargonium quarcticola Meve & E.M. Marais is described as a new species. It is a deciduous geophyte belonging to the section *Hoarea* (Sweet) DC. and is endemic to the quartz fields of the Knersvlakte in the northern part of the Western Cape. The species is characterized by small glandular, slightly sticky, almost red, pinnately compound or coralliform leaves with subsucculent pinnae, a leaf type not typical for *Pelargonium* section *Hoarea*. *P. quarcticola* flowers in August when the leaves are still alive. Illustrations of the species, the glandular hairs, a pollen grain, and a distribution map are provided.

Keywords: Geraniaceae, *Hoarea*, Knersvlakte, *Pelargonium*, quartz fields, South Africa.

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Introduction

Pelargonium quarcticola Meve & E.M. Marais is a deciduous geophyte belonging to the section *Hoarea* (Sweet) DC. It has a dwarf habit and a rather short growing season and presents its flowers in August when leaves are still alive. It was first collected by B. Nordenstam north-east of Bitterfontein in 1974 and is so far known from only three collections in the vicinity of Bitterfontein in the northern part of the Western Cape Province.

Material and Methods

Chromosome counts

Chromosome numbers were established from adventitious root tip squash preparations. The root tips were pretreated in 0.002 M hydroxyquinoline for 4 h at 20°C (Tjio & Levan 1950), fixed in Carnoy's solution for 24 h at 20°C and stained with carmine for 24 h at 60°C (Snow 1963). Voucher: *Schmiedel 109738*, in cultivation at Department of Plant Systematics, University of Bayreuth.

Palynology

Unacetolysed pollen grains were studied with the SEM and measurements were taken with the LM. Specimen studied: *Nordenstam & Lundgren 1415* (NBG).

Pelargonium quarcticola Meve & E.M. Marais, sp. nov. in section *Hoarea* distincta propter folia coralliformia et glandulifera. Geophytum folis parvis glanduliferis viscidis subrubis pinnatisectis vel coralliformibus, pinnis subsucculentis et floribus aliquantum magnis albis cremeis vel pallide roseis, petalis obovatis patentibus et stramineis longis protrusis.

TYPUS - South Africa, Western Cape Province: Blesberg, SE of Bitterfontein (3118 AB), 20 Aug. 1997, *Schmiedel 109738* (NBG, hol., PRE, UBT).

A deciduous geophyte, 50–100 mm tall when in flower. *Tuber*: subterranean, regular tuber, turnip-shaped or elongated, 15–50 mm long and 5–15 mm in diameter, covered with dark brown flaking periderms. *Leaves* radical, erect, petiolate, slightly succulent, green, turning red to reddish brown when exposed to sunlight, slightly sticky, covered with short glandular hairs (ca. 0.07 mm long) with small obliquely spherical heads, interspersed with longer glandular hairs (ca. 0.3 mm long) with ellipsoid heads; lamina ovate to elliptic in outline, 10–25 × 10–20 mm, regularly pinnately compound, pinnae obovate, irregularly insised (coralliform), segments obtuse; petiole 10–30 mm long, adaxially canaliculate; stipules subulate,

membranous, 4 × 1 mm, adnate to petioles, apices free, covered with glandular hairs. *Inflorescence*: scape 10–40 mm long, 2–3 mm in diameter, green to reddish brown, indumentum as on leaves, branched, bearing 2–3 pseudo-umbellets with 2–9 flowers each; peduncles 30–60 mm long, ca. 1.5 mm in diameter, indumentum as on leaves, reddish brown; bracts lanceolate-ovate, 3–4 × 1–2 mm, erect, abaxially glandular, margins ciliate with soft hairs, flower buds curved downwards, flowers and fruits erect. *Pedicel* 1–3 mm long. *Hypanthium* 8–12 mm long, ca. 1.5 times the length of the sepals, reddish brown, indumentum as on leaves. *Sepals* 5, broadly lanceolate, apices acute, 4–7 mm × 1–2 mm, recurved, abaxially covered with glandular hairs, green. *Petals* 5, white, cream-coloured or pale pink, patent during anthesis; posterior two with red feather-like markings, broadly obovate, slightly convex, 12–16 × 5–7 mm, length/width ratio smaller than 4, apices round or emarginate, short claw-shaped bases; anterior three obovate, slightly convex, bases attenuate, apices rounded, 10–13 × 3–4 mm. *Stamens* 10, basally connate, staminal column smooth, white; perfect stamens 5, posterior one 7–8 mm long, lateral two 9 mm long, anterior two 10 mm long, ca. 1.5 times the length of the sepals, protruding from the flower, white; anthers yellow, 1.5–2 mm long, pollen yellow. *Gynoeceum*: ovary superior, oblong-conical, 5-lobed, 3–6 mm long, densely sericeous, green; style 4.5–6 mm long, white; stigma with 5 recurved branches, 1.5–2 mm long, white. *Fruit*: a schizocarp consisting of 5 mericarps, bases of mericarps 4.5 mm long, tails, ca. 13 mm long. (Figures 1 and 2). *Chromosome number*: 2n = 22 (Voucher: *Schmiedel 109738*).

Diagnostic features and affinities

P. quarcticola is well defined by its slightly sticky, coralliform and slightly succulent leaves and the rather large white, cream-coloured or pale pink flowers with obovate patent petals and the protruding stamens. Another distinct character is the indumentum of all the different parts of the plant consisting of only two different types of glandular hairs (Figure 2) and no simple, non-glandular hairs at all. Subsucculent leaves as in *P. quarcticola* are rare in section *Hoarea*. Although more than 50% of the species in *Hoarea* grow in arid areas with an annual rainfall of less than 300 mm, the geophytic growth form, where leaves are present only during the favourable season, obviates the need for leaf succulence.

The patent petals and long protruding, slightly patent stamens resemble those of *P. tripalmatum* E.M. Marais (Marais 1996), *P. aridicola* E.M. Marais, *P. hirtipetalum* E.M. Marais, *P. pubipetalum*



Figure 1 *Pelargonium quarciticola*. A. Flowering plant at Blesberg, Knersvlakte. B. excavated plants from Blesberg showing the tubers (Schmiedel 109738; Photos: U. Schmiedel, 20 Aug. 1997).

E.M. Marais (Marais 1997a) and *P. reflexipetalum* E.M. Marais (Marais 1997b). The habit and the shape of the leaves resemble those of *P. caroli-hemrici* B. Nord. (Nordenstam 1987), although a subsucculent texture of the leaves is lacking in the latter.

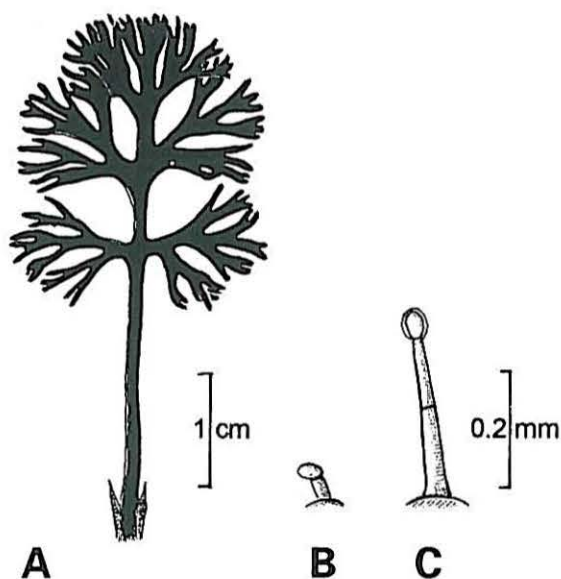


Figure 2 *Pelargonium quarciticola*. A. Leaf. B. Short glandular hair from leaf surface. C. Long glandular hair from leaf surface (scale bar of C valid for B and C).

Pollen morphology

The morphology of the pollen grains corresponds to that of the rest of the genus *Pelargonium* L'Hérit. in that the grains are spherical and tricolporate. The tectum of the pollen grains of *P. quarciticola* can be described as striate-reticulate (Figure 3; Bortenschlager 1967). A similar structure of the tectum occurs in nearly half the species of section *Hoarea* (Marais 1994), including *P. aridicola*, *P. hirtipetalum*, *P. pubipetalum* (Marais

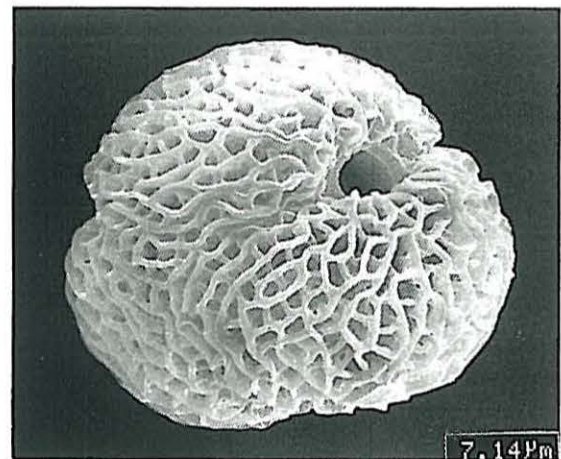


Figure 3 Almost polar view of a pollen grain of *Pelargonium quarciticola* with one colporate pore visible (SEM: Nordenstam & Lundgren 1415, NBG).

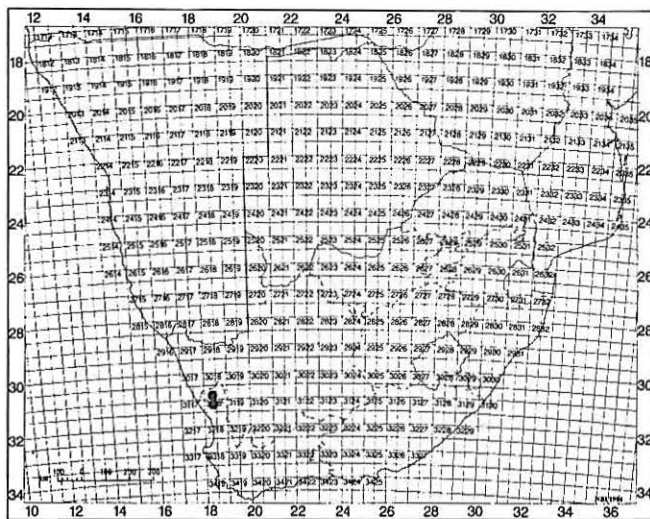


Figure 4 Distribution of *Pelargonium quarcitcola*.

1997a), *P. tripalmatum* (Marais 1996) and *P. reflexipetalum*, all species with a floral structure similar to *P. quarcitcola*. The variations in the dimensions of the pollen grains of *P. quarcitcola* are (60)–71–(82) μm for the equatorial axis and (57)–72–(82) μm for the polar axis. The grains are generally larger than those of the above mentioned five species (Marais 1996; Marais 1997a).

Karyology

Mitotic metaphases in root tips of *P. quarcitcola* showed a chromosome number of $2n = 22$. This corresponds to the most widespread situation in the genus (Albers 1990) as well as in section *Hoarea*, where more than 60% of the species investigated are known to be diploids possessing the basic chromosome number of $x = 11$ (Gibby *et al.* 1996). With an average length of 1.4 μm , the chromosomes fall within the group of small-sized chromosomes.

Reproductive system

P. quarcitcola is allogamous; it has been proven to be self-sterile.

Geographical distribution and ecology

So far *P. quarcitcola* is known from a small distribution area in the Knersvlakte northeast and southeast of Bitterfontein (Figure 4). This is mainly a winter rainfall region with an annual precipitation of 100–200 mm. *P. quarcitcola* flowers in August when the leaves are still alive. It grows in Succulent Karoo vegetation on gentle slopes or plains, which are more or less completely covered with white and angular quartz stones. Quartz fields in southern Africa form an edaphically extremely arid habitat. This is caused either by high salinity in the soil or by shallow soils with a high stone content and, therefore, low ability to store water (Schmiedel 1994; Schmiedel & Jürgens 1999). *P. quarcitcola* inhabits quartz fields with shallow, sandy-loamy, poorly developed soil of low salinity (< 1 mS/cm) and slight acidity (pH 6.5).

Dwarf growth forms are typical for the vegetation and endemic flora of the southern African quartz fields (Struck 1995; Schmiedel & Jürgens 1999). According to vegetation ecological studies, the dominance of dwarf growth forms has been interpreted as an adaptation to edaphic aridity and particular microclimatic conditions (Schmiedel & Jürgens 1999). The quartz fields of the Knersvlakte are known for the large number of endemic species. Schmiedel (unpubl. data) counted 58 taxa, here, constituting 41% of those 142 plant species, which are entirely restricted to quartz fields of southern Africa (Schmiedel & Jürgens 1999). *P. quarcitcola*, along with at least *Dicrocaulon*

sp. nov. (Aizoaceae; Ihlenfeldt, pers. comm.), *Phyllobolus digitatus* (Ait.) Gerbaulet ssp. *littlewoodii* (L. Bolus) Gerbaulet (Aizoaceae) and *Pentzia peduncularis* B. Nord. (Asteraceae) are restricted to the northwestern part of the Knersvlakte. Other species of *Pelargonium* section *Hoarea* occurring in the vicinity of Bitterfontein are *P. moniliforme* Harv., *P. incrassatum* (Andr.) Sims and *P. caroli-henrici*, of which only the latter is confined to the quartz fields of the Knersvlakte.

Material studied

—3018 (Kamiesberg): 12 km NE of Bitterfontein, 8 km on the Kliprand road (–CD), Nordenstam & Lundgren 1415 (NBG, S); Toontjieskop (–CD), Schmiedel 104587 (UBT).
—3118 (Vanrhynsdorp): Blesberg, SE of Bitterfontein (–AB), Schmiedel 109738 (NBG, PRE, UBT).

Conclusion

The systematic position of *P. quarcitcola* is unresolved. The floral structure of *P. quarcitcola* is very similar to that of *P. aridicola*, *P. hirtipetalum*, *P. pubipetalum*, *P. tripalmatum* and *P. reflexipetalum*. All the species have 7–20 mm short hypanthia (up to 34 mm in *P. aridicola*), long protruding, almost patent stamens, with apices slightly curved upwards during anthesis. They also share a similar pollen grain structure, but with the pollen grains slightly bigger in *P. quarcitcola*. (cf. Marais 1996; Marais 1997a). Most significant, however, *P. quarcitcola* differs in having a chromosome number of $2n = 22$, whereas the five above named species have $2n = 20$ (Gibby *et al.* 1996). The only other species of *Pelargonium* sect. *Hoarea* endemic to the Knersvlakte, *P. caroli-henrici*, also appears to be closely related since it has $2n = 22$ chromosomes (Nordenstam 1987) and a leaf-shape rather similar to that of *P. quarcitcola*. It also shows the closest ecological and biogeographical affinities to *P. quarcitcola*. However, *P. caroli-henrici* differs markedly in leaf texture and flower structure (4 stamens in *P. caroli-henrici*).

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