

A taxonomic revision of the type section of *Pelargonium* L'Hérit. (Geraniaceae)

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ABSTRACT

Twenty four species are recognized in this taxonomic treatment of the section *Pelargonium* which was last revised by Knuth in 1912. Most species occur in the south-western, southern and eastern Cape where they usually grow in rather moist, semi-shaded habitats. A key to the identification of the species has been compiled, and at least one illustration as well as a distribution map is presented for each species. The section is considered to be the most primitive section of the genus with a basic chromosome number of $x = 11$.

INTRODUCTION

In the section *Pelargonium* more species than in any other section have contributed towards the material welfare of mankind. A very large number of artificial hybrids, known as 'Regal Pelargoniums' or 'Martha Washingtons' in the USA, have been produced for ornamental purposes. Features of *P. cucullatum* (L.) L'Hérit. can be seen in many of these hybrids, and this well-known species could be considered as the most important ancestor. *P. graveolens* L'Hérit., *P. radens* H. E. Moore and other aromatic species of the section are the ancestors of another group of artificial ornamental hybrids known as 'Scented-leaved Pelargoniums'. Hybrids of *P. graveolens*, especially, are grown on a commercial scale for the production of geranium oil which is used as a substitute for attar of roses in the perfume trade.

When L'Héritier (1789) described the genus *Pelargonium*, he did not subdivide it. Sweet (1822) was the first to make a subdivision: he elevated L'Héritier's genus to tribal level and his tribe *Pelargonieae* included genera such as *Campylia* Sweet, *Jenkinsonia* Sweet and *Pelargonium*, which are currently considered as sections of the genus *Pelargonium*. His genus *Pelargonium* included species of the currently recognized section *Pelargonium* as well as members of other sections such as *Dibrachya* Sweet.

De Candolle (1824) reduced Sweet's tribe *Pelargonieae* to generic level as the genus *Pelargonium*, and subdivided the genus into 12 sections. One of these sections, *Pelargium* (the current section *Pelargonium*), was divided into four series. The present species of the section *Pelargonium* were included in his series *Anisopetala*.

Ecklon & Zeyher (1835) followed Sweet's classification system: they again raised the present genus *Pelargonium* to tribal level as the tribe *Pelargonieae*, which was divided into 15 genera. Their genus *Pelargonium* included species of the current section *Pelargonium*.

Harvey (1860) followed De Candolle's system and divided the genus *Pelargonium* into 15 sections. His

last section *Pelargium*, included 22 species of the current section *Pelargonium*. Knuth (1912) also followed basically the same system as De Candolle, and divided the section *Pelargonium* (*Pelargium*) into seven subsections. This subdivision was based on the colour of the petals, leaf characters and the length of the pedicel and hypanthium.

In 1979 Van der Walt proposed *P. cucullatum* as the lectotype species of the genus *Pelargonium*.

The section *Pelargonium* is distinguished by a combination of characters. Sweet (1812), De Candolle (1824), Ecklon & Zeyher (1835), Harvey (1860) and Knuth (1912) mentioned that the section is characterized by a shrubby habit, five petals of which the posterior two are larger than the anterior three, and the presence of seven fertile stamens. Some of these authors mentioned additional diagnostic features such as the shape of the leaves and the free stipules.

The geographical distribution of the section was discussed by Van der Walt & Vorster (1983). The 24 species occur in the south-western, southern and eastern Cape with a few species extending north-eastwards as far as the eastern highlands of Zimbabwe. The two highest concentrations of species, in the south-western and southern Cape, fall entirely within the winter rainfall region. Many of them, however, do not occur in close association with fynbos, but rather favour primitive, moist shaded habitats, often in association with forest precursors. The species in the eastern Cape receive rain in winter as well as summer, whereas those in the Transkei, Natal, Transvaal and Zimbabwe occur in a predominantly summer rainfall region.

The section *Pelargonium* is considered to be the most primitive section of the genus on account of its rather woody, much-branched, shrubby habit, simple leaves, and five-petalled flowers with seven fertile stamens. Albers & Van der Walt's (1984) chromosome study of the section supported this view. The basic chromosome number of the section is $x = 11$, which is most probably also the basic number for the genus. Furthermore, the chromosomes are relatively small in comparison with those of other sections of the genus. Twelve species are diploid ($2n=22$) and twelve polyploid ($2n=44, 66, 88$). The

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two species occurring in the Transvaal, *P. glutinosum* (Jacq.) L'Hérit, and *P. graveolens*, are both polyploids, which might indicate that the section had a southern origin.

Many species show continuous morphological variation, an indication that they are probably still in an active state of speciation. Natural hybrids between representatives of the section *Pelargonium*, as well as hybrids between representatives of the section *Pelargonium* and the sections *Eumorpha* (Eckl. & Zeyh.) Harv. and *Glaucophyllum* Harv., have been collected. A list of these hybrids with their putative parent species, is presented at the end of the paper.

This paper represents an alpha taxonomic treatment of the section. The species are phylogenetically arranged, but the relationships of the species will be discussed in detail in a following paper. In order to do so, use will be made of additional features, viz anatomy, pollen morphology and cytotaxonomy.

Section *Pelargonium*: DC., Prodr. 1: 658 (1824) (series IV, *Anisopetala* DC. p.p.); Harv. in Fl. Cap. 1: 301 (1860); Knuth in Pflanzenr. 4, 129: 320, 455 (1912) — all as *Pelargium*. Lectotype species: *Pelargonium cucullatum* (L.) L'Hérit. (see Van der Walt in Jt S. Afr. Bot. 45,3: 379–380 (1979) and Van der Walt & Vorster in Taxon 30: 307 (1981).

Genus *Pelargonium*: Sweet, Geran. 1: viii, 41 (1821) p.p.; Eckl. & Zeyh., Enum. 1: 78 (1835).

Erect to decumbent, branched to much-branched, non-aromatic to aromatic, non-viscid or viscid shrubs or subshrubs, up to 2,5 m high and 1,6 m in diameter. *Stems* herbaceous when young, becoming variously woody with age, sparsely to densely covered with different types of non-glandular and glandular hairs, young stems green but becoming greyish to brownish with age. *Leaves* simple, petiolate, stipulate, indumentum variable as on stems, dark green, green or greyish green; laminae entire to variously palmately or pinnately incised, shape variable but often cordiform, base usually cordate seldom cuneate or truncate, apices of laminae/lobes/segments obtuse or acute margins finely to coarsely dentate

or serrate, 5–250 × 3–270 mm; petioles 0–250 mm long; stipules free, usually cordiform or triangular and often apiculate or cuspidate, 2–20 × 1–15 mm. *Inflorescences:* flowering branches in some species profusely branched, with smaller and normal foliar leaves or smaller foliar leaves only; peduncles unbranched, in some species distinctly articulated at distal and proximal ends in infructescences, 5–150 mm long, indumentum variable as on stems; involucre bracts mostly ovate or lanceolate, apiculate to caudate, 3–10 × 1–7 mm, indumentum variable as on stems; pseudo-umbels with 1–20 flowers each. *Pedicels* 0,5–20 mm long, shorter or longer or as long as hypanthiums. *Hypanthiums* 1–14 mm long, base variably thickened, indumentum on pedicels and hypanthiums variable as on stems. *Sepals* 5, usually lanceolate, often apiculate, green and often with a reddish-brown tint, in some species with white margins, posterior one wider than other four, 7–20 × 2–6 mm. *Petals* 5, white, pink, pinkish-purple or purple; posterior two usually spatulate or obovate, apices often emarginate, with dark purple, wine-red or dark red feather-like markings, reflexed at less than 90°, 90° or more than 90°, 6–35 × 3–17 mm; anterior three usually spatulate or oblanceolate, with or without narrow claws, reflexed at less than 90°, 4–28 × 2–12 mm. *Fertile stamens* 7 (4 long, 1 medium, 2 short), often pinkish but becoming progressively paler towards hyaline staminal column, pollen orange; staminodes 3. *Ovary* 5-lobed, usually ovoid, densely pilose with apically directed hairs, white to green; style 5–12 mm long, base variably hairy; stigma with 5 recurved branches, purple to reddish; mericarps 5, bases 3–6 mm long, tails 12–30 mm long, plumose. 2n=22, 44, 66 or 88.

Diagnostic features

Erect to decumbent, non-aromatic to aromatic, non-viscid or viscid subshrubs or shrubs with rather woody stems. *Leaves* simple, laminae entire to variously palmately or pinnately incised. *Inflorescences:* flowering branches with smaller and normal foliar leaves or smaller foliar leaves only, pseudo-umbels with 1–20 flowers each. *Flowers* white, pink, pinkish-purple or purple; posterior petals with dark purple, wine-red or dark red feather-like markings; fertile stamens 7 (4 long, 1 medium, 2 short).

KEY TO THE SPECIES OF THE SECTION *PELARGONIUM*

- 1 Laminae without incisions or very shallowly lobed:
 - 2 Mature laminae less than 20 mm long:
 - 3 Laminae glabrescent to hirtellous:
 - 4 Laminae without incisions, circular to broadly elliptic to ovate and not viscid 2. *P. betulinum*
 - 4 Laminae lobed, cordiform, viscid 7. *P. glutinosum*
 - 3 Laminae hispid to strigose:
 - 5 Laminae narrowly obovate to broadly obovate, not crisped, base cuneate ... 20. *P. hermannifolium*
 - 5 Laminae reniform more or less crisped, base truncate to cordate:
 - 6 Laminae hispid, rose-camphor-scented, posterior petals 10–18 × 4–8 mm, pseudo-umbels 2–5-flowered 17. *P. englerianum*
 - 6 Laminae strigose, lemon-scented, posterior petals ca 18 × 10 mm, pseudo-umbels 1–2(–3)-flowered 19. *P. crispum*

- 2 Mature laminae more than 20 mm long:
- 7 Laminae glabrescent, scabrous or at least hard to the touch:
- 8 Laminae glabrescent to hirtellous:
- 9 Laminae without incisions or lobes:
- 10 Laminae circular to broadly elliptic to ovate, flowering branches not profusely branched, flowers almost actinomorphic 2. *P. betulinum*
- 10 Laminae cordiform, flowering branches profusely branched, flowers extremely zygomorphic 21. *P. cordifolium*
- 9 Laminae incised or lobed:
- 11 Leaves viscid, posterior and anterior petals almost equally sized 7. *P. glutinosum*
- 11 Leaves not viscid, posterior petals much larger than anterior ones:
- 12 Petioles and peduncles villous, young stems reddish-brown 15. *P. sublignosum*
- 12 Petioles and peduncles hirtellous to strigose, young stems green:
- 13 Lobes of laminae acute, flowers white to purple to pinkish-purple 12. *P. scabrum*
- 13 Lobes of laminae usually obtuse, flowers white to light pink:
- 14 Petioles much longer than laminae 18. *P. greytonense*
- 14 Petioles shorter than or as long as laminae 13. *P. ribifolium*
- 8 Laminae pubescent, hirsute, hispid or strigose:
- 15 Laminae pubescent to hirsute, flowers extremely zygomorphic 22. *P. hispidum*
- 15 Laminae strigose or hispid, flowers zygomorphic or almost actinomorphic:
- 16 Laminae hispid, bases truncate to cordate 17. *P. englerianum*
- 16 Laminae strigose, bases cuneate:
- 17 Laminae with shallow angular incisions in distal half, flowers almost actinomorphic, posterior petals at least 15 mm long 1. *P. cucullatum*
- 17 Laminae palmatilobate, flowers zygomorphic, posterior petals usually less than 15 mm long 12. *P. scabrum*
- 7 Laminae with long hairs or at least soft to the touch:
- 18 Laminae abaxially more hairy than adaxially and discolorous:
- 19 Laminae cordiform and not incised or lobed, flowering branches profusely branched, posterior petals much larger than anterior ones 21. *P. cordifolium*
- 19 Laminae panduriform to cordiform, pinnatilobate, posterior petals slightly larger than anterior ones 5. *P. panduriforme*
- 18 Laminae equally hairy adaxially and abaxially and not discolorous:
- 20 Laminae hood-shaped at base, posterior petals usually more than 20 mm long 1. *P. cucullatum*
- 20 Laminae not hood-shaped at base, posterior petals less than 20 mm long:
- 21 Pedicels up to 3 mm long, posterior petals slightly larger than anterior ones, pseudo-umbels capitulum-like:
- 22 Laminae crisped, villous to densely villous, pseudo-umbels 8-20-flowered, decumbent shrub 3. *P. capitatum*
- 22 Laminae not crisped, pilose to villous, pseudo-umbels 3-12-flowered, erect shrub 4. *P. vitifolium*
- 21 Pedicels more than 3 mm long, posterior petals much larger than anterior ones, pseudo-umbels not capitulum-like:
- 23 Young stems reddish-brown, pedicels shorter than hypanthiums, pseudo-umbels less than 10-flowered, flowering branches not profusely branched 15. *P. sublignosum*
- 23 Young stems green, pedicels longer than hypanthiums, pseudo-umbels usually more than 10-flowered, flowering branches profusely branched:
- 24 Laminae villous to tomentose, petals white, posterior petals with eared bases and less than 10 mm long 24. *P. tomentosum*
- 24 Laminae pubescent, sparsely villous or hirsute, petals pale pink to carmine, posterior petals without eared bases and more than 10 mm long:
- 25 Laminae palmatilobate, pubescent to hirsute, posterior petals without a white blotch 22. *P. hispidum*
- 25 Laminae shallowly lobed, sparsely villous, posterior petals with a white blotch 23. *P. papilionaceum*
- 1 Laminae palmatilobate to pinnatisect:
- 26 Margins of laminae segments revolute:
- 27 Laminae villous and soft to the touch, segments at least 3 mm wide 10. *P. graveolens*
- 27 Laminae hirsute and hard to the touch, segments less than 3 mm wide 11. *P. radens*
- 26 Margins of laminae segments or lobes not revolute:

- 28 Segments or lobes of laminae not incised:
- 29 Pedicels less than 3 mm long, posterior petals slightly larger than anterior ones:
- 30 Laminae glabrescent and very viscid 7. *P. glutinosum*
- 30 Laminae hairy, not viscid or somewhat viscid:
- 31 Laminae panduriform to cordiform, somewhat viscid, peduncles articulated, pseudo-umbels not capitulum-like, posterior petals at least 20 mm long 5. *P. panduriforme*
- 31 Laminae cordiform, not viscid, peduncles not articulated, pseudo-umbels capitulum-like, posterior petals less than 20 mm long:
- 32 Laminae crisped, villous to densely villous, pseudo-umbels 8–20-flowered, decumbent shrub 3. *P. capitatum*
- 32 Laminae not crisped, pilose to villous, pseudo-umbels 3–12-flowered, erect shrub 4. *P. vitifolium*
- 29 Pedicels more than 3 mm long, posterior petals much larger than anterior ones:
- 33 Laminae villous to tomentose and soft to the touch, bases of posterior petals eared, pedicels more than 18 mm long 24. *P. tomentosum*
- 33 Laminae pubescent, hirtellous, hirsute, hispid or villous but hard to the touch, bases of posterior petals not eared, pedicels less than 18 mm long:
- 34 Laminae more or less crisped and reniform 17. *P. englerianum*
- 34 Laminae not crisped and not reniform:
- 35 Young stems villous and reddish-brown 15. *P. sublignosum*
- 35 Young stems hirtellous or hirsute and green:
- 36 Laminae palmatifid to palmatisect, hirsute to hispid, flowers pinkish-purple 14. *P. citronellum*
- 36 Laminae palmatilobate to palmatipartite, hirtellous, flowers white to light pink:
- 37 Petioles much longer than laminae 18. *P. greytonense*
- 37 Petioles shorter or as long as laminae 13. *P. ribifolium*
- 28 Segments or lobes of laminae incised:
- 38 Laminae glabrescent, sparsely strigose or strigose, pedicels usually shorter than hypanthia, flowering branches not profusely branched:
- 39 Leaf segments pinnatifid to pinnatisect:
- 40 Leaf segments grooved adaxially and sparsely strigose 8. *P. denticulatum*
- 40 Leaf segments not grooved adaxially and strigose with a few soft hairs inbetween 6. *P. quercifolium*
- 39 Leaf segments irregularly incised:
- 41 Laminae viscid, posterior petals slightly larger than anterior ones, pedicels less than 3 mm long:
- 42 Larger veins of laminae often dark purple, laminae glabrescent to sparsely strigose, non-aromatic, pseudo-umbels less than 3-flowered 9. *P. pseudoglutinosum*
- 42 Larger veins of laminae never dark purple, laminae glabrescent, pseudo-umbels usually more than 3-flowered 7. *P. glutinosum*
- 41 Laminae not viscid, posterior petals much larger than anterior ones, pedicels more than 3 mm long:
- 43 Young stems wine-red, laminae 3-palmatisect to pinnatisect and non-aromatic 16. *P. scabroide*
- 43 Young stems green, laminae 3-palmatilobate to palmatisect, non-aromatic or lemon-scented 12. *P. scabrum*
- 38 Laminae pubescent, hirsute or hispid, pedicels longer than hypanthia, flowering branches profusely branched:
- 44 Laminae sparsely hirsute to hispid and strongly lemon-scented, pseudo-umbels usually less than 6-flowered, flowers pinkish-purple 14. *P. citronellum*
- 44 Laminae pubescent to hirsute and faintly lemon-scented, pseudo-umbels usually more than 6-flowered, flowers pale pink to pink 22. *P. hispidum*

1. *Pelargonium cucullatum* (L.) L'Hérit. in Ait., Hort. Kew. cdn 1,2: 426 (1789); Volschenk, J. J. A. v.d. Walt & Vorster in Bothalia 14: 45 (1982). Type: Africa, without precise locality, specimen in Hort. Cliff. 345. 17 (BM, lecto.!)

Erect, much-branched, non-aromatic shrub, up to 2 m high and 1 m in diameter. Stems herbaceous when young but soon becoming woody, sparsely to densely pubescent to villous and interspersed with glandular hairs, green but becoming brownish with age. Leaves villous or strigose and always beset with

glandular hairs, green to greyish-green; lamina circular, reniform or triangular in outline, with or without shallow angular incisions, conspicuously veined abaxially, flat to hood-shaped at base, base reniform, cordate or cuneate, apex obtuse to acute, margin irregularly denticulate, often entire in proximal $\frac{1}{4}$ of lamina, (20–) 40–55 (–110) × (20–) 50–90 (–180) mm; petiole (8–) 20–55 (–90) mm long; stipules ovate to narrowly ovate, acute, densely pilose, 5–10 × 3–7 mm. Inflorescence: flowering branches sometimes profusely branched, with normal and smaller foliar leaves; peduncles 20–70 mm long, pubescent

or pilose and always beset with glandular hairs; involucre bracts ovate to broadly ovate, acute, sparsely pilose to villous, 5–9 × 2–4 mm; pseudo-umbels with (1–) 3–9 (–13) flowers each. *Pedicel* 2–11 mm long, villous. *Hypanthium* 5–12 mm long. *Sepals* elliptic to narrowly elliptic, villous, green to reddish-brown, 12–20 × 2–6 mm. *Petals* pale pink to dark pinkish-purple, rarely white; posterior two spatulate to obovate, apices obtuse to emarginate, with dark purple streaks and a reddish-purple tinge at the bases, widening to reddish-purple patches, reflexed at less than 90°, 15–32 × 6–17 mm; anterior three spatulate to obovate to elliptic, with reddish-purple markings, slightly reflexed, 15–28 × 6–12 mm. 2n=22. Figs 1, 2, & 3.

Diagnostic features

Erect, much-branched, non-aromatic shrub. Lamina circular, reniform or triangular in outline, with or without shallow angular incisions, villous or strigose, flat to hood-shaped at base. Pseudo-umbels with (1–) 3–6 (–13) flowers each. Flowers relatively large, pale pink to dark pinkish-purple, pedicel usually as long as hypanthium.

Key to the subspecies

Margin of lamina more or less angularly incised:

Lamina villous; central vascular bundle in petiole with a fibrous column (a) subsp. *cucullatum*

Lamina strigose; central vascular bundle in petiole mostly without a fibrous column (c) subsp. *strigifolium*

Margin of lamina not angularly incised, lamina villous; central vascular bundle in petiole with a fibrous column (b) subsp. *tabulare*

(a) subsp. *cucullatum*. Volschenk, J. J. A. v.d. Walt & Vorster in *Bothalia* 14:47 (1982).

Geranium cucullatum L., Sp. Pl. edn 1:677 (1753) p.p., emend. Volschenk; Burm. f., *Geran.* 35 (1759) p.p.; L., Sp. Pl. edn 2: 946 (1763) p.p., Berg., *Descr. Pl. Cap.* 174 (1767) p.p.; Burm. f., *Prodr. Fl. Cap.* 18 (1768) p.p.; Thunb., *Prodr.* 114 (1794) p.p.; Fl. Cap. 518 (1823) p.p.—var. *fimbriatum* Burm. f., *Geran.* 35 (1759); *Prodr. Fl. Cap.* 18 (1768). *Pelargonium cucullatum* (L.) L'Hérit. in Ait., *Hort. Kew.* edn 1.2: 426 (1789) p.p.; J. J. A. v.d. Walt, *Pelarg. S. Afr.* 1:12, fig. (1977) p.p.; J. J. A. v.d. Walt & Vorster, *Pelarg. S. Afr.* 2:43, fig. (1981). *Geranospermum cucullatum* (L.) Kuntze, *Rev. Gen.* 1:93 (1891).

Geranium angulosum Mill., *Gard. Dict.* edn 8, no. 22 (1768). *Pelargonium angulosum* (Mill.) L'Hérit. in Ait., *Hort. Kew.* edn 1.2: 426 (1789); Salisb., *Prodr.* 314 (1796); Willd., *Sp. Pl.* 3: 671 (1800); Pers., *Syn. Pl.* 2:231 (1807); Willd., *Enum.* 706 (1809); Ait. f., *Hort. Kew.* edn 2.4: 174 (1812); DC., *Prodr.* 1:672 (1824); G. Don., *Gen. Syst.* 1: 740 (1831); Eckl. & Zeyh., *Enum.* 1:80 (1835); Harv. in *Fl. Cap.* 1: 302 (1860); Knuth in *Pflanzenr.* 4,129:460 (1912); Salter in Adamson & Salter, *Fl. Cape Penins.* 518 (1950). *Geranospermum angulosum* (Mill.) Kuntze, *Rev. Gen.* 1:94 (1891).

Geranium acerifolium Cav., *Diss.* 4:243, t. 112, fig. 2 (1787); Thunb., *Prodr.* 114 (1794); Fl. Cap. edn 2: 520 (1823). *Iconotype*: Cav., *Diss.* 4: t.122, fig. 2 (1787).

Diagnostic features

Lamina slightly to strongly hood-shaped, shallowly and angularly incised in distal half, base obtusely subcordately to cuneately incised, villous; petiole usually shorter than lamina, with a central fibrous column present in the central vascular bundle. *Pseudo-umbels* with 5–7 flowers each. *Petals* usually dark pinkish purple, occasionally white. Fig. 1.



FIG. 1. — *Pelargonium cucullatum* subsp. *cucullatum*. a, flowering branch, × 1; b, petals, × 1; c, androecium, × 2; d, gynoecium, × 2. (From Ward-Hilhorst 4 B, collected at Betty's Bay.)

Subsp. *cucullatum* has a small, continuous distribution from the vicinity of Gansbaai in the east to Gordon's Bay in the west, with a few isolated populations in the Cape Peninsula which are separated from the rest by False Bay (Fig. 2). The leaves of the plants on the peninsula are less villous than elsewhere. The plants occur from near the high water mark on the narrow coastal flats and in the lower foothills of the mountains, but always practically within sight of the sea.

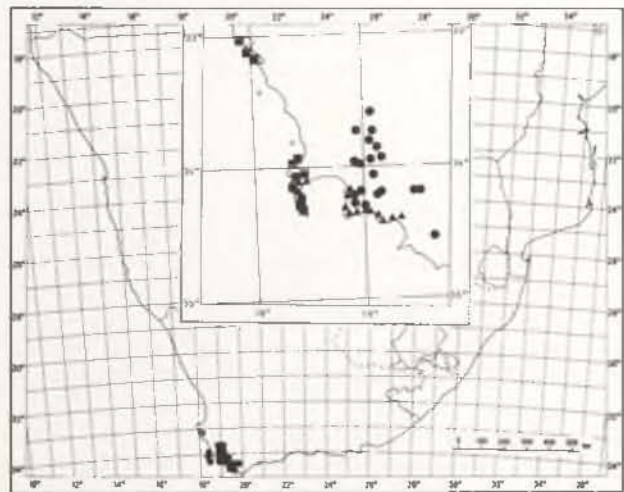


FIG. 2. — Known geographical distribution of *Pelargonium cucullatum*. ▲ subsp. *cucullatum*; ■ subsp. *tabulare* ● subsp. *strigifolium*.

Subsp. *cucullatum* is a constituent of moist coastal fynbos. It occurs under a rainfall regime of 400–800 mm per annum, on well-drained, sandy soils which are mainly derived from Table Mountain Sandstone.

Flowering takes place from September to February. The impression was gained that individual plants of this subspecies have a longer flowering period than subsp. *tabulare* and this may be ascribed to the moister, perhaps more favourable environmental conditions experienced by subsp. *cucullatum*.

CAPE PROVINCE.—3318 (Cape Town): Table Mountain, near Constantia (–CD), *Ecklon 623* (W). 3418 (Simonstown): Kalkbaai (–AB), *Zeyher s.n.* (SAM); Muizenberg (–AB), *Dümmer 512* (E), *Lansdell s.n.* (PRE), *MacOwan 79* (BOL; PRE; SAM; W), *Marloth 35* (PRE), *Penther 2171* (W), *Scott-Elliott 197* (E); Silver Mine Valley (–AB), *Pillans 2708* (BOL); Simonstown (–AB), *Marloth 3615* (PRE; STE), *Volschenk 22* (STEU); Gordon's Bay (–BB), *Davis s.n.* (SAM), *Duthie 306* (STEU), *Volschenk 40* (STEU); between Gordon's Bay and Betty's Bay (–BD), *Dyer 5761* (PRE); between Gordon's Bay and Koelbaai (–BD), *Ihlenfeldt 1673* (PRE); Betty's Bay (–BD), *Rycoft 2722, 2775, 3155* (NBG); *Van der Schijff 7424* (PRE), *Van der Walt 433* (STEU), *Volschenk 23, 49* (STEU), *Werdermann & Oberdieck 711* (PRE); Hangklip (–BD), *Rodin 3126* (BOL), *Taylor 5866* (NBG); Harold Porter Reserve (–BD), *Ebersohn 62/68* (NBG), *Van der Walt 649* (STEU); Koelbaai (–BD), *Boucher 473* (PRE). 3419 (Caledon): near Hermanus (–AC), *Gillet 28* (STE), *Jordaan 896* (STE), *Rogers 26600* (PRE), *Van der Walt 492* (STEU); Kleinmond (–AC), *Pillans 8234* (BOL), *Strey 2964* (PRE), *Van Breda 1432* (PRE), *Volschenk 1, 2, 3, 4* (STEU); Voëklip (–AC), *Barker 1613* (NBG); Kleinrivier Mountains (–AD), *Ecklon 625* (W); Mosselrivier (–AD), *Potts 5011* (SAM), *Verkijs s.n.* (STE); near Stanford (–AD), *Radloff s.n.* (PRE); between Stanford and Hermanus (–AD), *Gillet 4175* (BOL), *Marsh 872* (STE).

(b) subsp. *tabulare* *Volschenk* in *Bothalia* 14: 49 (1982). Type: Africa, without precise locality, specimen in Hort. Cliff. 345. 17 ♂ (BM, holo!).

Geranium cucullatum L., Sp. Pl. edn 1: 677 (1753) p.p.; Burm. f., Geran. 35 (1759) p.p.; L., Sp. Pl. edn 2: 946 (1763) p.p.; Berg., Descr. Pl. Cap. 174 (1767) p.p.; Burm. f., Prodr. Fl. Cap. 18 (1768) p.p.; Cav., Diss. 4:241, t. 106, fig. 1 (1787); Thunb., Prodr. 114 (1794) p.p.; Fl. Cap. 518 (1823) p.p.; *Pelargonium cucullatum* (L.) L'Hérit. in Ait., Hort. Kew. edn 1, 2: 426 (1789) p.p.; Willd., Sp. Pl. 3: 670 (1800); Enum. 706 (1809); Pers., Syn. Pl. 2: 231 (1807); Ait. f., Hort. Kew. edn 2, 4: 174 (1812); DC., Prodr. 1: 671 (1824); Spreng., Syst. Veg. 3: 58 (1826); G. Don, Gen. Syst. 1: 740 (1831); Eckl. & Zeyh., Enum. 1: 80 (1835); Harv. in Fl. Cap. 1: 302 (1860); Marloth, Fl. Kapl. 116, fig. 30 (1908); Knuth in Pflanzenr. 4, 129: 466 (1912); Marloth, Fl. S. Afr. 2: 90 (1925); Salter in Adamson & Salter, Fl. Cape Penins. 518 (1950); Mason, Western Cape Sandveld Flow. 134, t. 56 (1972); J. J. A. v.d. Walt, Pelarg. S. Afr. 1: 12, fig. (1977) p.p. (pro icon.).

Diagnostic features

Lamina hood-shaped, circular in outline, base reniformly to cordately incised, villous; petiole equaling or exceeding lamina in length, with a central fibrous column present in the central vascular bundle. *Pseudo-umbels* with (5–) 6–9 (–13) flowers each. *Petals* usually dark pinkish purple. Fig. 3.

Subsp. *tabulare* occurs in two relatively restricted areas separated from each other by a distance of about 90 km, namely on the Cape Peninsula where it ranges from Lion's Head and Table Mountain southwards to Cape Point and in the vicinity of Saldanha Bay (Fig. 2). On the Cape Peninsula it occurs as a component of fynbos, from sea level to about 500 m against the mountain slopes, but always practically within sight of the sea. It grows on well-drained, usu-



FIG. 3. — *Pelargonium cucullatum* subsp. *tabulare*. a, flowering branch, $\times 1$; b, petals, $\times 1$; c, androecium, $\times 1.5$; d, gynoecium, $\times 2$; e, pedicel, hypanthium and sepals, $\times 1$. (From Ward-Hilhorst 35, collected at Scarborough.)

ally stony and often sandy soils derived from Table Mountain Sandstone, shale and tillite. It receives an annual rainfall of 400–1 000 mm on the Cape Peninsula. In the Saldanha Bay area it occurs in fynbos vegetation in sheltered ravines, under conditions somewhat reminiscent of those on the Cape Peninsula, but receiving only about 200 mm of rain per annum.

It should be noted that the Saldanha Bay plants are smaller than those on the Cape Peninsula, especially in respect of the leaves and flowers, but this appears to be a result of less favourable environmental conditions and is not of taxonomic significance.

The flowering period extends from late September to February, with a peak in October and November.

CAPE PROVINCE.—3318 (Cape Town): Langebaan (–AA), *Axelsson 3576* (NBG), *Taylor 3773* (NBG); Postberg Nature Reserve (–AA), *Volschenk 28, 29* (STEU); peninsula west of Saldanha Bay (–AA), *Pillans 6883* (BOL), *Salter 3925* (BOL); Camp's Bay (–CD), *Ecklon & Zeyher 4827* (SAM), *Marloth 9356* (PRE), *Volschenk 9, 10* (STEU); Cape Town (–CD), *Pegler s.n.* (PRE), *Young s.n.* (PRE); Devil's Peak (–CD), *Thompson 31* (PRE), *Wolley-Dod 2469* (BOL); Kirstenbosch (–CD), *Grant 2639* (PRE); north of Window Stream (–CD), *Esterhuysen 501* (BOL; PRE); Lion's Head (–CD), *Van der Walt 470* (STEU); Sea Point (–CD), *Willms 3074* (Z); Signal Hill (–CD), *Volschenk 6, 7, 8* (STEU); Table Mountain (–CD), *Bolus 2729* (BOL), *Dümmer 332* (E), *Ecklon 608* (W), *Ecklon & Zeyher 621* (SAM; W), *Flanagan 2415* (PRE), *Guthrie 2394* (NBG; PRE), *MacOwan 6472* (SAM), *Rodin 3221* (BOL; PRE), *Schenk 551* (Z), *Thode A5* (PRE), *Werdermann & Oberdieck 65* (PRE). 3418 (Simonstown): farm Bergvliet (–AB), *Purcell 237* (SAM); s.n. (BOL); south of Houtbaai (–AB), *Smuts s.n.* (STE); Muizenberg (–AB), *Pillans s.n.* (PRE); Oceanview near Kommetjie (–AB), *Van der Walt 664* (STEU); Simonstown, Red Hill (–AB), *Leighton 3062*

(BOL), *Pillans 2194* (BOL), *Rogers 11282* (PRE); Wynberg Hill (-AB), *Salter 6393B* (BOL), *Verdoorn s.n.* (PRE); Cape of Good Hope Nature Reserve (-AD), *Dahlstrand 1080* (PRE); Cape Point (-AD), *Herre s.n.* (STE); Buffelsbaai (-AD), *Gillett 768* (STE); Olifantsbos (-AD), *Leighton 3055, 3056, 3057* (BOL), *Rycroft 2189* (NBG); near Vasco da Gama Hill (-AD), *Hutchinson 652* (BOL; PRE).

(c) subsp. *strigifolium* Volschenk in *Bothalia* 14: 50 (1982). Type: as for *P. acerifolium* L'Hérit. below.

Pelargonium acerifolium L'Hérit. in Ait., Hort. Kew. edn 1,2: 427 (1789); Geran. t. 21 (1792); Salisb., Prodr. 315 (1796); Pers., Syn. Pl. 2: 231 (1807); Willd., Enum. 706 (1809); Ait. f., Hort. Kew. edn 2,4: 174 (1812); DC., Prodr. 1: 672 (1824); Spreng., Syst. Veg. 3: 61 (1826); Eckl. & Zeyh., Enum. 1: 80 (1835); Knuth in Pflanzenreich 4, 129:461 (1912); non *Geranium acerifolium* Cav. (1787), *Pelargonium angulosum* (Mill.) L'Hérit. var. *acerifolium* (L'Hérit.) Harv. in Fl. Cap. 1: 303 (1860). Iconotype: L'Hérit., Geran. t. 21 (1792).

Diagnostic features

Lamina flat to somewhat hood-shaped, shallowly and angularly incised in distal half, base cuneately incised, strigose and with glandular hairs longer than ordinary hairs; petiole usually shorter than lamina, with a central fibrous column absent (rarely present) in the central vascular bundle. *Pseudo-umbels* with 3-5 flowers each. *Petals* usually light pink to pinkish purple. Fig. 4.

Subsp. *strigifolium* has a montane distribution in the south-western Cape Province, being known from the mountains around Bainskloof in the north to



FIG. 4. — *Pelargonium cucullatum* subsp. *strigifolium*: a, flowering branch, $\times 1$; b, petals, $\times 1$; c, androecium, $\times 2$; d, gynoecium, $\times 2$; e, pedicel, hypanthium, sepals and stamens, $\times 1$. (From Van der Walt 463, cultivated in Stellenbosch.)

Baardskeerdersbos in the south, and the southern Hottentotsholland Mountains in the west to the Kleinrivier Mountains near Caledon in the east, at altitudes of 300-900 m (Fig. 2). In contrast to the subspecies *cucullatum* and *tabulare*, this subspecies does not occur in close proximity to the sea.

Like the other two subspecies, it is a constituent of fynbos. Few precise rainfall figures are available for its montane habitats, but the rainfall over the general area varies from about 600 to 1 000 mm per annum. It grows on soils derived from sandstone, shale and tillite, and in the vicinity of Paarl and Jonkershoek also on soils derived from granite and granofir. These soils can be quite heavy.

Plants from the Swartberg near Caledon are smaller than elsewhere, probably occurring under less than optimal conditions at the eastern border of the area which is climatically suitable for this subspecies.

Flowering takes place from September to January, with a peak in October and November.

CAPE PROVINCE. — 3318 (Cape Town): Paarl Mountain (-DB), *Marais s.n.* (STEU), *Marloth 3480* (PRE), *Van der Walt 652* (STEU), *Volschenk 12, 33* (STEU); Wellington (-DB), *Knobel s.n.* (PRE); Jonkershoek (-DD), *Borchardt 301* (STE), *Marais s.n.* (STEU), *Smith 306b* (STEU), *Van der Walt 428, 506, 641* (STEU), *Volschenk 5* (STEU); Jonkershoek, Assegaaiboskloof (-DD), *Van der Walt 517* (STEU); Jakkalsvlei (-DD), *Taylor 5153, 6956* (PRE); Swartboskloof (-DD), *Van der Merwe 2126* (STE), *Van der Walt 418* (STEU), *Van Rensburg 2074* (PRE), *Walgate 987* (STE); Stellenbosch (-DD), *Wawra 123* (W); Stellenbosch, Botmaskop (-DD), *Van der Walt 537* (STEU), *Van Rensburg 371, 374* (STE); near Paradise (-DD), *Herre s.n.* (STE), 3319 (Worcester); Bainskloof (-CA), *Gillett 788* (BOL), *Kies 43* (NBG); Du Toitskloof, western entrance (-CC), *Pillans 8461* (BOL); Franschhoek (-CC), *Boucher 2353* (PRE; STE), *Phillips 1058* (SAM), *R.G. 5136* (PRE), *Thode A2187* (PRE), *Volschenk 35* (STEU); Franschhoek Forest Reserve (-CC), *Esterhuysen s.n.* (BOL); Klein Drakenstein Mountains, Kasteelkloof (-CC), *Kruger 1465* (STE); mountains between Franschhoek and Villiersdorp (-CC), *Bolus 5136* (BOL); Wemmershoek Mountains (-CC), *Drijfhout 463* (STEU), *Esterhuysen 4044* (PRE); 17718 (BOL; PRE), 3418 (Simonstown); mountains south of Gordon's Bay (-BB), *Marloth 10119* (PRE), *Smith 306a* (STEU); Hottentotshollandkloof (-BB), *Ecklon & Zeyher 627* (SAM; W); Koelberg Forest Reserve (-BB), *Rycroft 1438* (BOL; NBG; PRE); Sir Lowry's Pass (-BB), *Volschenk 39* (STEU); Steenbras Dam (-BB), *De la Bai s.n.* (STE; STEU), *Salter 6518* (BOL); Arieskraal near Palmiet River (-BD), *Barker 3335* (NBG), *Leighton 784* (BOL); between Betty's Bay and Cape Hangklip (-BD), *Ihlenfeldt 1718* (PRE); Kleinmond (-BD), *Compton 12370* (NBG), 3419 (Caledon); between Villiersdorp and Elgin (-AA), *Bayliss 707* (PRE); Elgin (-AA), *Van Breda 563* (PRE); Grabouw (-AA), *Bolus 4112b* (BOL); 4112c (BOL); Lebanon River (-AA), *Van der Zyl Z19; Z65* (PRE); Houhoek Pass, 5 km west of Botrivier (-AA), *Barker 8804* (NBG), *Volschenk 38* (STEU); Palmiet River (-AA), *Penther 2153* (W); Caledon (-AB), *Penther 2136* (W); Swartberg (-AB), *Galpin 3820* (PRE), *Volschenk 36* (STEU), *Zeyher s.n.* (PRE; SAM); Paardeberg at Palmiet River Mouth (-AC), *Grohler 29286* (PRE; STE); Caledon, Hartebees River (-BC), *Elbrecht 22136* (PRE); near Strandkloof (-CB), *Van der Walt 603* (STEU); Baardskeerdersbos, on the hills (-DA), *Volschenk 44* (STEU).

2. *Pelargonium betulinum* (L.) L'Hérit. in Ait., Hort. Kew. edn 1,2: 429 (1789); Curtis in Curtis's bot. Mag. 5: t. 148 (1792); Willd., Sp. Pl. 3: 665 (1800); Pers., Syn. Pl. 2: 230 (1806); Ait. f., Hort. Kew. edn 2,4: 170 (1812); DC., Prodr. 1: 699 (1824); Spreng., Syst. Veg. 3: 57 (1826); Eckl. & Zeyh., Enum. 1: 78 (1835); Harv. in Fl. Cap. 1: 301 (1860); Szyszyl., Polypet. Thalam. Rehm.: 14 (1887); Knuth in Pflanzenr. 4,129: 457 (1912); Adamson & Salter,

Fl. Cape Penins.: 519 (1950); Levyns, Guide Flow. Cape Penins.: 173, fig. 84 (1866); Kidd, Wild Flow. Cape Penins. edn 2: t. 62 (1973); J.J.A. v.d. Walt, Pelarg. S. Afr. 1: 49, fig. (1977). Lectotype: 'Habitat in Africa', LINN 858.9!

Geranium betulinum L., Sp. Pl. edn 1: 679 (1753); Burm. f., Geran.: 33 (1759); L., Sp. Pl. edn 2.2: 946 (1763); Berg., Descr. Pl. Cap.: 175 (1767); Burm. f., Prodr. Fl. Cap.: 18 (1768); Mill., Gard. Dict. edn 8. no. 43 (1768); Murray, Syst. Veg. edn 14: 613 (1784); Cav., Diss. 4: 238 (1787); Thunb., Prodr.: 113 (1794); Thunb., Fl. Cap.: 516 (1823).

Pelargonium betulaefolium Salisb., Prodr.: 316 (1796), nom. superfl.

P. penicillatum Willd., Hort. Berol.: 37 (1805). Type: 'Habitat ad Caput. bonae spei'. Willd. Herb. B12451 (B. holo.!).

P. georgense Knuth in Reprim nov. Spec. Regni veg. 28: 92 (1930). Type: Cape Province, Ruigtevlei near Swart River, George. Fourcade 1542 (BOL, holo.!, PRE!, STE!).

Erect to decumbent, branched to much-branched, non-aromatic shrub or subshrub, up to 1,5 m high and 1,5 m in diameter. Stems herbaceous when young but soon becoming woody, sparsely to densely pubescent and with a few glandular hairs in between, green but becoming brownish with age. Leaves glabrescent to hirtellous and with a few scattered glandular hairs, green; lamina circular to broadly elliptic to ovate, flat, veins depressed, base shallowly cordate to cuneate, apex obtuse, margin usually rather coarsely dentate to serrate with the teeth often red-tipped, (8-) 20 (-40) × (5-) 15 (-30) mm; petiole (4-) 10 (-20) mm long; stipules triangular, usually acuminate, pubescent and with a few glandular hairs in between, 3-7 × 1-4 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 15-90 mm long, pubescent

to villous and with glandular hairs interspersed; involucre bracts lanceolate, apiculate, indumentum as on stipules, 6-8 × 2-3 mm; pseudo-umbels with 2-6 flowers each. Pedicel 4-15 mm long, pubescent to pilose and with glandular hairs interspersed. Hypanthium 3-8 mm long, indumentum as on pedicel. Sepals lanceolate, indumentum abaxially as on pedicel, green to reddish-brown with a white margin, ca 12 × 2-4 mm. Petals pale pink to purplish, exceptionally almost white; posterior two broadly spatulate to obovate, with feather-like reddish-purple markings, reflexed at less than 90°, ca 25 × 15 mm; anterior three spatulate with rather broad claws, slightly reflexed, ca 22 × 7 mm. 2n=22. Fig. 5.

Diagnostic features

Erect to decumbent, branched to much-branched, non-aromatic shrub or subshrub. Lamina circular to broadly elliptic to ovate, flat, veins depressed, margin rather coarsely dentate to serrate. Pseudo-umbels with 2-6 relatively large, pink to purplish flowers each, pedicel usually longer than hypanthium.

P. betulinum occurs from the vicinity of Yzerfontein in the south-western Cape along the coast to Knysna in the southern Cape (Fig.6). The plants usually grow on sandy dunes or flats, mostly in close proximity to the coast. Its distribution area falls entirely in the winter rainfall region. Temperatures are high during summer and the winters are practically frost free.

P. betulinum flowers from August to January with a peak during September to November. Odd flowers are found throughout the year.

There is a resemblance between the flowers of *P. betulinum* and *P. cucullatum* (L.) L'Hérit., but their leaves differ markedly, those of the latter species being larger, hairy and more or less hood-shaped. A natural hybrid between these two species has been recorded (Van der Walt & Vorster, Pelarg. S. Afr. 2:45 (1981). Superficially, the flowers and leaves of *P. betulinum* resemble those of *P. elegans* (Andr.) Willd. of the section *Campylia*, but the habit of these two species differs completely.

Whitish flowers of *P. betulinum* have been recorded from plants occurring in Llandudno on the Cape Peninsula, and also from those growing on the hard, lime-rich dunes of De Hoop Nature Reserve near Bredasdorp. Plants collected in the Mossel Bay-Knysna areas, show a much coarser leaf margin than those from the south-western Cape.

CAPE PROVINCE. — 3318 (Cape Town): Slangkop near Yzerfontein (-AD), Leighton 3058 (BOL), Sidey 2148 (MO); Rondebosch (-CD), Wolley Dod 56, 57 (BOL); Kirstenbosch (-CD), Ecklon & Zeyher 1848 (MO); near Cape Town (-CD), Laubner 191 (Z), Young 26418 (PRE), Zeyher 14586 (SAM); Blackheath (-DC), Bayliss 4367, 2428 (NBG), Van der Walt 438 (STEU); Vygekraal (-DC), Pillans 2784 (BOL); Durbanville (-DC), Barker 1652 (NBG), 3321 (Ladismith); Huisrivier Pass (-CB), Bayliss 4367 (MO), 3322 (Oudtshoorn); Wilderness (-DC), Martin 130 (NBG); Ruigtevlei near George (-DD), Fourcade 1542 (BOL; K; PRE), 3418 (Simonstown); Llandudno (-AB), Van der Walt 486 (STEU); Klein Leeukop (-AB), Volshenk 18 (STEU); Retreat (-AB), Dümmer 379, 436 (E); Wynberg (-AB), Bolus 513 (BOL; PRE), 3262 (BOL; SAM), MucOwan 513 (BOL; PRE), 2703 (MEL; SAM); Wynberg Hill (-AB), Marloth 202 (PRE); Hout Bay (-AB), Bond 443 (NBG),



FIG. 5. — *Pelargonium betulinum*. a, flowering branches, × 1; b, petals, × 1; c, androecium, × 1.5; d, gynoecium, × 3. (From Ward-Hilhorst 5, collected at Leeukoppie.)

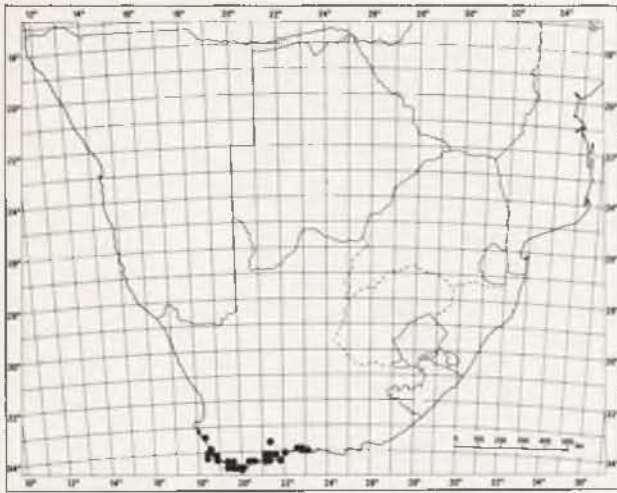


FIG. 6. — Known geographical distribution of *Pelargonium betulinum*.

Fairall 180 (NBG). Prior s.n. (Z); Muizenberg (-AB). Brain 5865 (SRGH); Chapman's Bay (-AB). Salter 7812 (BOL); Kalk Bay (-AB). Scott Elliot 1157 (E); Karbonkelberg (-AB). Barker 1669 (NBG). Esterhuysen 26245 (BOL); Kommetjie (-AB). Kies 139 (NBG); Bergvliet Farm (-AB). Purcell 239 (SAM); Fish Hoek (-AB). Young 263 (PRE); Olifantsbos (-AD). White 5691 (PRE); between Eersterivier and Swartklip (-BA). Pillans 9210, 9248 (BOL); Cape Flats (-BA). Marloth 5322, 6005 (PRE). Rehmann 2170 (Z). Thompson 1883 (PRE). Werdermann & Oberdieck 231 (PRE); Strand (-BB). Parker 3922 (BOL; NBG). Srey 720 (PRE); Betty's Bay (-BD). Ebersohn s.n. (NBG). Taylor 4765 (NBG). Topper 126 (NBG). Van der Walt 435 (STEU). Volschenk 25, 51 (STEU); Hangklip (-BD). Boucher 521 (PRE). Lavranos 15157A (PRE). Taylor 5844 (NBG); Kogel Bay (-BD). Werdermann & Oberdieck 284 (PRE). 3419 (Caledon); near Stanford (-AD). Gillett 4403 (BOL; PRE). Van der Walt 601 (STEU). Volschenk 48 (STEU); Kleinrivier Mountains (-AD). Ecklon & Zeyher 30280 (SAM); near Uilenkraalmond (-BC). Volschenk 45 (STEU); Die Kelders (-CB). Taylor 6914 (PRE). Volschenk 47 (STEU); Van Dyksbaai (-CB). Volschenk 46 (STEU); Gansbaai (-CB). Rabinowitz s.n. (SAM). Schonken 158 (STEU); Strandkloof (-CB). Compton 18215 (NBG). Leighton 1930 (BOL). Van der Walt 607, 1048 (STEU); Baardskeerdersbos (-DA). Hugo 625 (PRE); Heuningrug (-DB). Fischer 281 (STEU); Mierkraal (-DB). Fischer 274 (STEU); Poort near Bredasdorp (-DB). Barker 2529 (NBG). Compton 9023, 23198 (NBG). Esterhuysen 2998 (PRE). Leighton 21083 (BOL). 3420 (Bredasdorp); Kathoek near Bredasdorp (-AD). Pillans 9378 (BOL); De Hoop Nature Reserve (-AD). Van der Walt 1330 (STEU); near Potberg (-BC). Esterhuysen 23243 (BOL); Bredasdorp Hills (-CA). Bond 455 (NBG); Farm Kleiheuwel (-CA). Albertyn s.n. (STEU); Cape Agulhas (-CC). Fischer 289 (STEU). Pillans 8165 (BOL). Venter 7452 (STEU). 3421 (Riversdale); Corente River (-AA). Muir 5061 (PRE); Melkhoutfontein (-AB). Galpin 3822 (PRE); Renosterkop (-AB). Smith 4953 (PRE); Riversdale (-AB). Muir 1069 (BOL; PRE); S of Riversdale (-AC). Oliver 5993 (PRE); Stilbaai (-AD). Johnson 109 (NBG). Morris 262 (NBG); between Riversdale and Stilbaai (-AD). Goldblatt 4146 (MO). Wurts 1563 (NBG); near Albertinia (-BA). Bayliss 3658 (NBG; SRGH; Z); between Gouritsmond and Stilbaai (-BD). Rycroft 3121 (NBG). 3422 (Mossel Bay); Fransmanshoek (-AA). Van der Walt 678 (STEU); Mossel Bay (-AA). Morau s.n. (BOL). Rogers 4180 (GRA; NBG); Groot-Brakrivier (-AA). Sidey 1730 (MO; PRE); 5 km W of Groot-Brakrivier (-AA). Thompson 556 (PRE); Goukamma (-BB). Heineken 272 (PRE). 3423 (Knysna); Sedgfield (-AA). Middlemost 2051 (NBG); Knysna (-AA). Keet 847 (GRA; PRE). Leighton 3334 (BOL). Marloth 7533 (PRE).

3. *Pelargonium capitatum* (L.) L'Hérit. in Ait., Hort. Kew. edn 1,2: 425 (1789); Salisb., Prodr.: 314 (1796); Willd., Sp. Pl. 3: 676 (1800); Pers., Syn. Pl. 2: 232 (1806); Willd., Enum.: 707 (1809); Ait. f., Hort. Kew. edn 2,4: 176 (1812); DC., Prodr. 1: 676 (1824); Spreng., Syst. Veg. 3: 61 (1826); Eckl. &

Zeyh., Enum. 1: 80 (1835); Harv. in Fl. Cap. 1: 303 (1860); Hanks & Small, N. Amer. Fl. 25: 24 (1907); Knuth in Pflanzenr. 4,129: 467 (1912); Phillips in Rep. S. Afr. Ass. Advmt. Sci.: 456 (1918); Adamson & Salter, Fl. Cape Penins.: 519 (1950); Batten & Bokelmann, Wild Flow. E. Cape: 90, t. 75: 5 (1966); Courtenay-Latimer & Smith, Flow. Pl. Tsitsikamma: t. 39 (1967); Mason, West. Cape Sand. Flow.: 134, t. 56,5 (1972); J.J.A. v.d. Walt, Pelarg. S. Afr. 1: 7, fig. (1977); Rourke, Fairall & Snyman in Jl S. Afr. Bot. 47: 562 (1981). Lectotype: 'Habitat in Africa', LINN 858.17!

Geranium capitatum L., Sp. Pl. edn 1,2: 678 (1753); Burm. f., Geran.: 35 (1759); L., Sp. Pl. edn 2,2: 947 (1763); Burm. f., Prodr. Fl. Cap.: 18 (1768); Mill. Gard. Diet. edn 8, no. 25 (1768); L., Mant.: 432 (1771); Murray, Syst. Veg. 13: 511 (1774); Cav., Diss. 4: 249, t. 105, fig. 1 (1787); Murray, Syst. Veg. 15: 652 (1797); Thunb., Prodr. 2: 114 (1800); Andr., Geran. 1: C, ic (1805); Desf., Arb. 1: 461 (1809). *Geraniopsis capitatum* (L.) Kuntze, Rev. Gen. 1: 94 (1891).

Pelargonium drummondii Hook. f. in Curtis's bot. Mag. 120: t. 7346 (1894) ex descr. & icon., non Turcz. in Bull. Soc. Nat. Moscow 31: 421 (1858).

Decumbent, much-branched, rose-scented subshrub, up to 1m high and 1,6m in diameter. Stems herbaceous, becoming somewhat woody with age, pilose to densely villous and with glandular hairs interspersed, green but becoming brownish with age. Leaves villous to densely villous and densely interspersed with glandular hairs, green to greyish-green; lamina 3-5-palmatilobate to 3-5-palmatipartite, crisped, base cordate, lobes sometimes shallowly



FIG. 7. — *Pelargonium capitatum*. a, flowering branch, $\times 1$; b, petals, $\times 1$; c, androecium, $\times 2$; d, gynoecium, $\times 2$; e, pedicel, hypanthium and sepals, $\times 1$. (From Ward-Hilhorst 3; collected at Muizenberg.)

lobed, apices of lobes obtuse, margins irregularly crenate-dentate, (20–) 40 (–115) × (30–) 50 (–160) mm; petiole (5–) 20 (–55) mm long; stipules broadly ovate to cordiform, often apiculate, 7–12 × 5–14 mm. *Inflorescence*: flowering branches with normal and smaller foliar leaves; peduncles 30–150 mm long, villous to densely villous and densely interspersed with glandular hairs; involucre bracts broadly lanceolate, apiculate to cuspidate, indumentum as on leaves, 8–10 × 3–5 mm; capitulum-like pseudo-umbels with 8–20 flowers each. *Pedicel* 0.5–2 mm long. *Hypanthium* 3–8 mm long, densely villous and with glandular hairs interspersed. *Sepals* lanceolate, apiculate, indumentum as on hypanthium, green but apices often reddish, ca 10 × 3–4 mm. *Petals* pale pink to dark pink-purple; posterior two spatulate, apices obtuse, with dark purple markings, reflexed at ca 90°, ca 18 × 6 mm; anterior three spatulate with narrow claws, slightly reflexed, ca 16 × 6 mm. 2n=66. Fig. 7.

Diagnostic features

Decumbent, much-branched, rose-scented subshrub. Lamina 3–5-palmatilobate to 3–5-palmatipartite, crisped, villous to densely villous. Pseudo-umbels capitulum-like, with 8–20 flowers each. Flowers pale pink to dark pink-purple, pedicels much shorter than hypanthium.

P. capitatum occurs from Lambert's Bay in the west along the coast through the Transkei to Zululand (Fig. 8). The plants usually grow on sandy dunes or flats, mostly in close proximity to the coast. In the interior, it is usually found in disturbed habitats. Populations in the south-western part of its distribution area receive winter rains, those in the southern Cape winter as well as summer rains, whereas the eastern Cape, Transkei and Natal populations receive rain predominantly during the summer months. Temperatures are high to very high during the summer and the winters frost free.

P. capitatum has a definite flowering peak during spring, especially in September and October, but odd flowers may be found throughout the year.

P. capitatum is closely related to *P. vitifolium* (L.) L'Hérit. and the differences between these two species are tabulated under *P. vitifolium*. The villous leaves of *P. capitatum* can also be confused with those of *P. tomentosum* Jacq., but they have a completely different odour, the leaves of *P. capitatum* being rose scented and those of *P. tomentosum* having a peppermint scent. Furthermore, the inflorescences and flowers of these two species differ markedly.

Two specimens of *P. capitatum*, LINN 858.17 and Hort. Cliff. 345.15 (BM), both with the epithet in the handwriting of Linnaeus, are available as possible lectotypes. I decided to choose the specimen in LINN as the lectotype, because Linnaeus's first reference in *Species Plantarum* (1753) is to Hort. Ups. and not to Hort. Cliff.

NATAL. — 2831 (Nkandla): Nkandla Forest Reserve (–CA), Moffett 3003 (STEU); Ngoye (–DC), Wood 9360 (BOL; MEL; PRE; SAM), 2930 (Pietermaritzburg): Kranzkloof (–DD), Haygarth 22337 (PRE), Rogers 17177 (Z), 3030 (Port Shepstone): St.

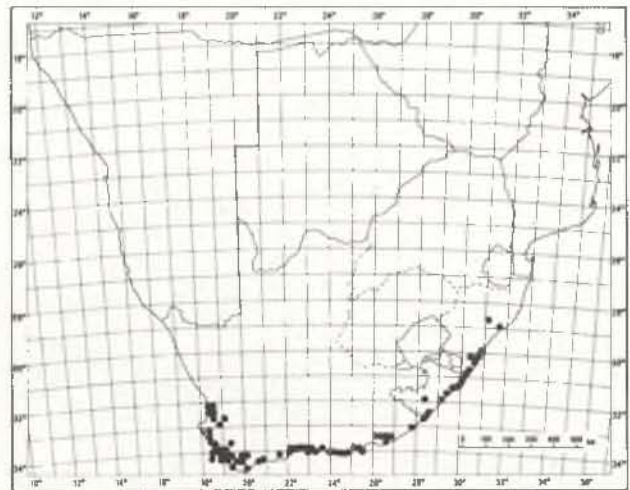


FIG. 8. — Known geographical distribution of *Pelargonium capitatum*.

Michaels (–AB), Prosser 1458 (PRE); Umkomaas (–BB), Dyer 3122 (PRE), Forbes 1227 (NH), Theiler 10027 (PRE), Wood 7177 (E; NH); Pennington (–BC), Repton 1282 (PRE); Ifafa (–BC), Huntley 216 (PRE); Clansthal, Umzinto (–BC), Galloway 102 (MO); Scottburgh (–BD), Crookes 3 (PRE); Uvongo (–CB), Mogg 13198 (SRGH); Umtamvuna (–CC), Codd 10696 (PRE), Strey 5842 (NH; PRE); Port Shepstone (–CD), Wood 9759 (NBG); Southbroom (–CD), Whellan 1105 (PRE; SRGH), 3130 (Port Edward); Port Edward (–AA), Strey 4344, 5842 (PRE); Craigadour Farm near Port Edward (–AA), Nicholson 1605 (PRE).

TRANSKEI. — 3128 (Umtata): Mntentu (–CD), Strey 8647 (PRE; SRGH), 3129 (Port St. Johns): Lusikisiki Magna Waterfall (–BC), Venter & Vorster 16 (PRE); Mateku Waterfall (–BC), Strey 10167 (E; PRE); Mkambati Leper Hospital (–BD), Marais 1196 (PRE); Ndininindi (–CB), Venter 932 (PRE); Umtata River Mouth (–CC), Acocks 13566 (PRE), 3130 (Port Edward): Umtentu River Mouth (–AC), Marais 1196 (NBG; PRE), 3228 (Butterworth): Mazeppa Bay (–BC), Theron 1201 (BOL; PRE); Kentani Coast (–CB), Pegler 120 (BOL; SAM); Kobongaba (–DA), Taylor 3538 (NBG).

CAPE PROVINCE. — 3218 (Clanwilliam): Lamberts Bay (–AB), Hardy & Bayliss 1034 (PRE); 20 km from Elandsbaai on Redelinghuys Road (–AD), Van der Walt 598 (STEU); between Darling and Ysterfontein (–BA), Rycroft 1818 (NBG); near Paleisheuwel (–BC), Schonken 89 (STEU); Het Kruis (–DA), Zinn s.n. (SAM); Piketberg (–DD), Schonken 88 (STEU), 3219 (Wuppertal): Theerivier, Citrusdal (–CA), Hanekom 1143 (PRE; SRGH), 3228 (Butterworth): Kei Mouth (–CB), Flanagan 163 (BOL; PRE), Van der Walt 685 (STEU), 3318 (Cape Town): Hopefield (–AB), Bachmann 1534 (Z), Letty 114 (PRE); near Darling (–AD), Bolus 12629 (BOL), Winkler 115 (NBG); Melkbosstrand (–CB), Dahlstrand 1055 (PRE); Robben Island (–CD), Walgate 463 (NBG); between Blouberg and Melkbos (–CD), Axelson 357 (NBG); Devils Peak (–CD), Thompson s.n. (PRE); Lions Head (–CD), Van der Walt 469 (STEU); near Bolus Herbarium (–CD), Leighton 3206, 3207, 3208 (BOL); Kirstenbosch (–CD), Barker 225 (BOL), Zeyher 32 (SAM); Camps Bay (–CD), Elbrecht 22135 (PRE), Hutchinson 147 (BOL; PRE), Rehmann 1603 (Z); Kenilworth Race Course (–CD), Van der Walt 545 (STEU); Rondebosch (–CD), Dümmer 269 (E); Clifton (–CD), Phillips s.n. (PRE); Cape Town (–CD), Bolus 2728 (PRE), Schinz s.n. (Z); Dieprivier (–DA), Ecklon & Zeyher 7 (PRE); Groot Springfontein (–DC), Wasserfall 248 (NBG); Joostenberg (–DC), Barker 9603 (NBG); Blackheath (–DC), Van der Walt 443 (STEU); W of Koelenhof (–DD), Thompson 2648 (PRE); Klapmuts (–DD), Ecklon & Zeyher 631 (MO; SAM); Lyndoch (–DD), Taylor 5796 (NBG), 3319 (Worcester): 18 km from Worcester on Bothashalt Road (–CB), Van Breda 554 (PRE); Bothashalt (–CB), Van Breda 912 (PRE; SRGH); near Franschoek (–CC), Van der Walt 453 (STEU), Volschenk 15 (STEU); Wemmershoek Mountains (–CC), Van der Walt 465 (STEU); Franschoek (–CC), Phillips 1055 (SAM), Schlechter 9220 (BOL), Schlechter 9253 (MO), Thode A2188 (PRE), 3322 (Oudtshoorn); Robinson Pass (–CC), Heginbotham 220 (NBG).

Van der Walt 1125 (STEU); Ruitersbos (-CC), *Van Niekerk 39* (BOL); Montagu Pass (-CD), *Van der Walt 423(a)*, 1138, 1307 (STEU); 10 km E of George (-CD), *Schonken 186A* (STEU); Wilderness (-DC), *Heginbotham 196* (NBG); near Rondevlei, Sedgefield (-DC), *Bayliss s.n.* (PRE); Rheenendal near Knysna (-DD), *Neser s.n.* (STEU); Ruigtevlei (-DD), *Martin 4540* (PRE), 3323 (Willowmore); Prince Alfred's Pass (-CC), *Van der Walt 721* (STEU); Nature's Valley (-DC), *Immelman 78* (PRE); near Nature's Valley (-DC), *Von Teichman 355* (PRE), 3325 (Port Elizabeth); Van Stadens Pass (-CC), *Theron 569* (PRE); near Uitenhage (-CD), *Bolus 757* (BOL), 3326 (Grahamstown); Hoffman's Bosch (-AC), *Britten 1297* (PRE); Komgha (-AC), *Flanagan 1525* (SAM); Assegaiabos (-AD), *Breyer 23593* (PRE); Farm Rosslyn, Bloukrans (-BC), *Bayliss 5328* (Z), *Bayliss 5374* (MO; WAG); Grahamstown (-BC), *MacOwan 677* (SAM), *Rogers 27417* (Z); Woest Hill (-BC), *Bayliss 4501* (MO); between Bathurst and Port Alfred (-BD), *Barker 10501* (NBG); Boesmansriviermond (-DA), *Van der Walt 693* (STEU), 3327 (Pieddie); East London (-BB), *Batten s.n.* (NBG), *Galpin 5841* (PRE), *Leifert 79* (Z), *Nanni 135* (PRE), 3418 (Simonstown); Kalk Bay (-AB), *Bolus 2728* (BOL), *Goldblatt 1405* (MO); Wynberg (-AB), *Schenck 610* (Z), *Zeyher s.n.* (SAM); Wynberg Hill (-AB), *Pillans 10163* (MO); near Wynberg (-AB), *Goldblatt 2680* (MO); Llandudno (-AB), *Van der Walt 490* (STEU), *Willems 69* (NBG), *Young 217* (PRE); Shelly Beach (-AB), *Letty s.n.* (PRE); Hout Bay (-AB), *Galpin 3806* (PRE), *Marloth 428* (PRE); Kommetjie (-AB), *Young 266* (PRE); between Retreat and Muizenberg (-AB), *Schlechter 644* (Z); Muizenberg (-AB), *Pillans 2857* (BOL); Silvermine (-AB), *Oberdieck 112* (PRE), *Werdermann & Oberdieck 116* (PRE); road to Constantia Neck (-AB), *Guthrie 1000* (NBG); Klaasjagersberg (-AB), *Sidey 2149* (MO); Bergvliet (-AB), *Purcell 236* (SAM); Simonstown (-AB), *Brown s.n.* (E), *Durao s.n.* (E), *Marloth 3619* (PRE); between Simonstown and Miller's Point (-AB), *Phillips 379* (NBG); Cape Point Nature Reserve (-AD), *Leighton 3054* (BOL), *Rycroft 2192* (NBG); Isoetes Vlei, Cape Flats (-BA), *Mathews 27* (NBG), *Rowe 26* (NBG); Strandfontein (-BA), *Van Zinderen-Bakker 23* (NBG), *White 5107* (PRE); Macassar (-BA), *Taylor 3185* (PRE), *Werdermann & Oberdieck 200* (PRE; WAG); Cape Flats (-BA), *Phillips s.n.* (Z), *Rehmann 2177* (Z), *Rogers 27217* (Z); Faure (-BB), *Van der Walt 516* (STEU); Sir Lowry's Pass (-BB), *Caplan s.n.* (Z), *Guthrie 2991* (NBG); Strand (-BB), *Parker 4925* (BOL; NBG), *Strey 742* (PRE); Groot Hangklip (-BD), *Boucher 775* (PRE); Kogelbaai (-BD), *Boucher 474* (PRE; SRGH); Betty's Bay (-BD), *Topper 147* (NBG), *Van der Walt 432* (STEU), 3419 (Caledon); Houwhoek Pass (-AA), *Van der Walt 794* (STEU); Caledon (-AB), *Gillet 4484A* (PRE); Onrusrivier (-AC), *Van Niekerk 340* (BOL; PRE); Hermanus (-AC), *Gillet 4483* (PRE); Vermont (-AC), *Gillet 4483* (BOL; PRE); Kleinmond (-AC), *De Vos 775* (PRE), *Van der Merwe s.n.* (STEU); near Brakfontein, Riviersonderend (-BB), *Fischer 306* (STEU); Uilenkraal (-BC), *Taylor 1555* (SAM); Oubos near Greyton (-BD), *Van der Walt 709* (STEU); Baviaansfontein, Gansbaai (-CB), *Stokoe 7400* (BOL); 16 km E of Gansbaai (-CB), *Taylor 4903* (MO; NBG); 3420 (Bredasdorp); Ratelrivier (-AA), *Van Breda 827* (PRE); Stormsvlei (-AA), *Fischer 290* (STEU); Farm Elandspoort (-BC), *Pillans 9411* (BOL); Cape Infanta (-BD), *Blum s.n.* (E); between Elim and Bredasdorp (-CA), *Marsh 925* (PRE); Farm Kleiheuvel (-CA), *Van der Walt 609* (STEU); Cape Agulhas (-CC), *Venter 7455* (STEU), 3421 (Riversdale); near Albertinia (-BA), *Muir 1802* (BOL; PRE), 3422 (Mossel Bay); Little Brak River (-AA), *Sidney 1731* (PRE); 19 km from Mossel Bay to George (-AA), *Acocks 15393* (PRE), *Story 3102* (PRE); Rhee-bok (-AA), *Van der Walt 673* (STEU); 5 km from Great Brak River (-AA), *Marsh 567* (PRE); Great Brak River (-AA), *Thorne s.n.* (SAM); near Mossel Bay (-AA), *Lewis 3910* (SAM), *Rogers 4161* (NBG; Z); near Bottelierskop (-AA), *Van der Walt 1130*, 1134 (STEU); Goukamma (-BB), *Schlieben & Ellis 12334* (PRE), 3423 (Knysna); Knysna (-AA), *Bayliss 1378* (Z), *Breyer 23974* (PRE), *Galpin 3819* (PRE), *Rehmann 463* (Z), *Rogers 22321* (PRE), *Rogers 27156* (Z); Buffalo Bay (-AA), *Keet 846* (PRE); Robbeberg (-AA), *Werdermann & Oberdieck 962* (PRE); Plettenberg Bay (-AB), *Ecklon & Zeyher s.n.* (PRE), *Lavranos 12939* (PRE), *Rogers 28396* (Z), *Rogers & Smart 24656* (PRE), *Theron 1780* (PRE); Keurboomsvier (-AB), *Taylor 6010* (NBG); Tsitsikamma National Park (-BB), *Botha 126* (PRE), *Liebenberg 7876* (PRE), 3424 (Humansdorp); Witelsbos (-AA), *Leighton 3070* (BOL); Clarkson (-AB), *Thode A756* (PRE); near Kareedouw (-AB), *Fourcade 4413* (PRE), *Thode A2590* (PRE); Klipdrift (-BA), *Thode A2467* (PRE); Cape St. Francis (-BB), *Bayliss 6797* (MO; Z); 32 km from Humansdorp

to Cape St. Francis (-BB), *Wells 2966* (PRE); 10 km NE of Jeffrey's Bay (-BB), *Hutchinson 1465* (BOL), 3425 (Skoenmakerskop); Skoenmakerskop (-BA), *Van der Walt 564* (STEU).

4. *Pelargonium vitifolium* (L.) L'Hérit. in Ait., Hort. Kew. edn 1,2: 425 (1789); Salisb., Prodr.: 314 (1796); Willd., Sp. Pl. 3: 675 (1800); Pers., Syn. Pl. 2: 232 (1806); Willd., Enum.: 707 (1809); Ait. f., Hort. Kew. edn 2,4: 176 (1812); DC., Prodr. 1: 674 (1824); Spreng., Syst. Veg. 3: 60 (1826); G. Don, Gen. Syst. 1: 740 (1831); Harv. in Fl. Cap. 1: 303 (1860); Knuth in Pflanzenr. 4,129: 468 (1912); Adamson & Salter, Fl. Cape Penins.: 519 (1950); J.J.A. v.d. Walt, Pelarg. S. Afr. 1: 49, fig. (1977). Lectotype: Habitat in Africa, Hort. Ups., 858.15 (LINN).

Geranium vitifolium L., Sp. Pl. edn 1,2: 678 (1753); Burm. f., Geran.: 34 (1759); L., Sp. Pl. edn 2,2: 947 (1763); Burm. f., Prodr. Fl. Cap.: 18 (1768); Mill., Gard. Dict. edn 8, no. 26 (1768); Cav., Diss. 4: 245, t. 111, fig. 2 (1787); Thunb., Prodr. 2: 114 (1800); Thunb., Fl. Cap. edn 2: 521 (1823).

G. ribisoides Burm. f., Geran.: 34 (1759). Type: 'Habitat in Cap. Bon. Spei.', Burm. Herb. 377/176 (G).

Erect, branched, strongly aromatic shrub, up to 1 m high and 0,75 m in diameter. *Stems* herbaceous when young but soon becoming woody, villous and interspersed with glandular hairs. *Leaves* pilose to villous and densely interspersed with glandular hairs, green; lamina cordiform in outline, shallowly 3 (-5)-lobed, base cordate, apices of lobes obtuse, margins irregularly crenate, (25-) 45-60 (-87) × (25-) 60-80 (-115) mm; petiole (25-) 50 (-145) mm long; stipules broadly ovate to triangular or narrowly triangular, often apiculate, 8-15 × 5-15 mm. *Inflorescence*: flowering branches with normal and smaller foliar leaves; peduncles 15-100 mm long, pilose to villous and densely interspersed with glandular hairs; involucre bracts ovate to lanceolate, acute to caudate, indumentum as on stipules, 5-10 × 2-5 mm; capitulum-like pseudo-umbels with 3-12 flowers each. *Pedicel* 0,5-3 mm long, indumentum as on stipules. *Hypanthium* 2-4 mm long, indumentum as on stipules. *Sepals* lanceolate, abaxially pilose to hirsute and with glandular hairs interspersed, green with a reddish-brown tint, ca 10 × 2,5-4 mm. *Petals* pale pink to light pinkish-purple; posterior two spatulate, apices obtuse to retuse, with dark purple markings, reflexed at ca 90°, ca 18 × 7 mm; anterior three spatulate with narrow claws, slightly reflexed, ca 16 × 5 mm. 2n=88. Fig. 9.

Diagnostic features

Erect, branched, strongly aromatic shrub. Lamina cordiform in outline, shallowly 3- (5)-lobed, pilose to villous. Capitulum-like pseudo-umbels with 3-12 flowers each. Flowers pale pink to light pinkish-purple, pedicel and hypanthium relatively short, pedicel usually slightly shorter than hypanthium.

P. vitifolium occurs from the Cape Peninsula in the south-western Cape eastwards along the coast to Knysna in the southern Cape (Fig. 10). Its distribution area falls entirely in the winter rainfall region. Although consistently associated with mountains, it is confined to the lower slopes where it occurs in shady ravines, usually near streams between boulders or on scree. The soil in these situations is usually sandy, often with a high percentage of organic mat-

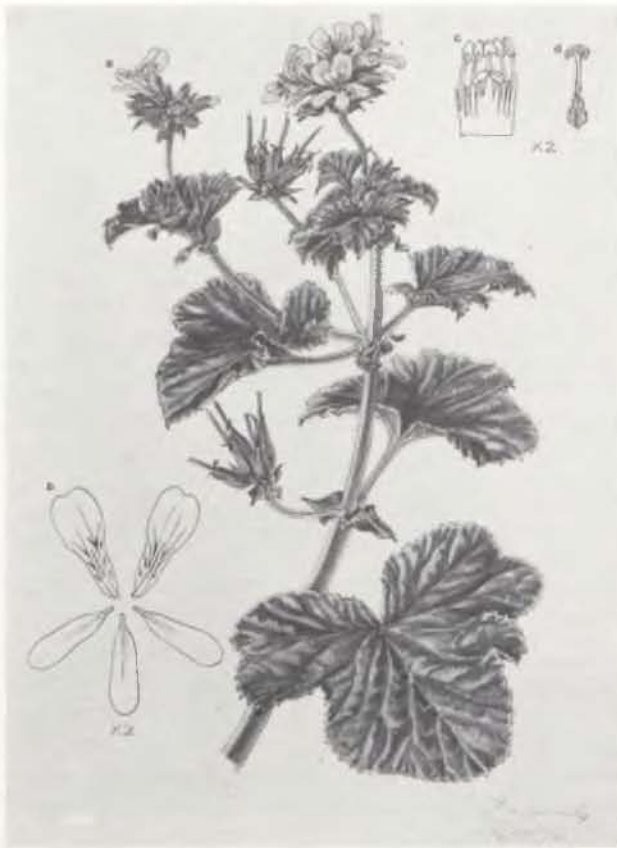


FIG. 9. — *Pelargonium vitifolium*. a, flowering branch, $\times 1$; b, petals, $\times 2$; c, androecium, $\times 2$; d, gynoecium, $\times 2$. (From Ward-Hilhorst 88, collected at Helderberg Nature Reserve.)

ter. Temperatures are high during summer and the winters are practically frost free.

P. vitifolium flowers from August to January with a peak in October–November. Except for the mid-winter months, odd flowers can be found throughout the year.

P. vitifolium is closely related to *P. capitatum* (L.) L'Hérit. The following characters may be used to distinguish between these two species:

<i>P. vitifolium</i>	<i>P. capitatum</i>
1. Erect shrub with an unpleasant scent.	1. Decumbent rose-scented subshrub.
2. Leaves pilose to villous and not crisped.	2. Leaves villous to densely villous and crisped.
3. Pseudo-umbels with 3–12 flowers each.	3. Pseudo-umbels with 8–20 flowers each.

Two specimens of *P. vitifolium*, LINN 858. 15 and Hort. Cliff. 345. 15 (BM), both with the epithet in the handwriting of Linnaeus, are available as possible lectotypes. I decided to choose the specimen in LINN as the lectotype, because Linnaeus referred to Hort. Ups., and not to Hort. Cliff., in his *Species Plantarum* (1753).

CAPE PROVINCE. — 3318 (Cape Town): Devil's Peak, Table Mountain (–CD). *Zeyher s.n.* (BOL); Ferry Gully, Table Mountain, *Esterhuysen 18330* (BOL); Kirstenbosch (–CD), *Esterhuysen 30839* (BOL); U.C.T., Rondebosch (–CD), *Esterhuysen 23545* (BOL; PRE); near Rhodes Memorial, Table Mountain

(–CD), *Salter 6392* (BOL); Paarlberg (–DB), *Drège s.n.* (PRE); Dal Josafat near Paarl (–DB), *Tyson 940* (SAM); Jonkershoek near Stellenbosch (–DD), *Page 14201* (BOL), *Van der Merwe 23–59* (SRGH), *Van der Walt 515* (STEU), *Van der Walt & Vorster 1324* (STEU); Swartboskloof, Jonkershoek (–DD), *Van Rensburg 2188* (PRE); Guardian Peak, Jonkershoek (–DD), *Esterhuysen 24127* (BOL); Bothmaskop, Stellenbosch (–DD), *Van der Walt 523* (STEU); Banhoek near Stellenbosch (–DD), *Martley s.n.* (BOL), *Thorne s.n.* (SAM); Vergenoeg, Stellenbosch (–DD), *Van der Walt 499* (STEU), 3319 (Worcester); Du Toitskloof (–CA), *Pillans 8492* (BOL); French Hoek (–CC), *Schlechter 9220* (Z), 9253 (E; BOL; PRE; Z), 1574a (PRE), 3322 (Oudtshoorn); Robinson Pass near Mossel Bay (–CC), *Esterhuysen 19419* (BOL; PRE), 3418 (Simonstown); Wynberg Park (–AB), *Rogers s.n.* (PRE); Wynberg Hill (–AB), *Salter s.n.* (PRE), *Wolley Dod 1977* (BOL); Helderberg, Somerset West (–BB), *Esterhuysen 14639* (BOL; MO); Helderberg Nature Reserve, Somerset West (–BB), *Van der Walt & Vorster 1321* (STEU); Hottentot Holland (–BB), *Zeyher 221* (MEL), 3419 (Caledon); Elim near Bredasdorp (–DA), *Bolus 8527* (BOL), *s.n.* (NBG), 3423 (Knysna); Portland near Knysna (–AA), *Duthie 1161* (BOL; STE).

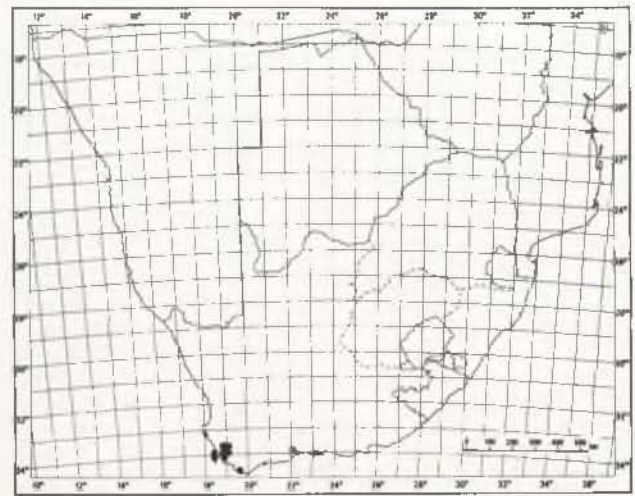


FIG. 10. — Known geographical distribution of *Pelargonium vitifolium*.

5. *Pelargonium panduriforme* (sphalm. *panduriforme*) *Eckl. & Zeyh.*, Enum. 1: 82 (1835); Knuth in *Pflanzenr.* 4, 129: 473 (1912). Type: Cape Province, ' . . . in lateribus montium "Winterhoeckberge" occidentem spectantibus in deserto "Karoo" dicto (Uitenhage)', *Ecklon & Zeyher 640* (S, lecto.!, M!; MO!; OXF!; SAM!).

Geranium terebinthinaceum Murray in *Comm. Soc. Gott.* 7: 88, t. 4 (1786). Iconotype: Murray in *Comm. Soc. Gott.* 7: 88, t. 4 (1786).

Geranium quercifolium sensu Cav., *Diss.* 4: 246, t. 119, fig. 1 (1787).

Pelargonium quercifolium sensu L'Hérit. in *Ait., Hort. Kew.* edn 1, 2: 422 (1789) excl. var. *b*; sensu L'Hérit., *Geran.* t. 14 (1792); sensu Salisb., *Prodr.*: 313 (1796) p.p.; sensu Willd., *Sp. Pl.* 3: 678 (1800) p.p.; sensu Pers., *Syn. Pl.*: 232 (1806) p.p.; sensu Dietr., *Lex. Gärt.* 7: 49 (1807) p.p.; sensu Willd., *Enum.* 2: 708 (1809) p.p.; sensu DC., *Prodr.* 1: 678 (1824) p.p.; sensu Eckl. & Zeyh., *Enum.* 1: 82 (1835); sensu Steud., *Nom. Bot.* edn 2, 2: 289 (1841) p.p.; sensu Harv. in *Fl. Cap.* 1: 306 (1860) p.p.; sensu Knuth in *Pflanzenr.* 4, 129: 472 (1912) p.p.; omnes non *P. quercifolium* (L.f.) L'Hérit (1789).

Erect, branched, strongly balm-scented, somewhat viscid shrub, up to 1,75 m high and 0,5 m in diameter. *Stems* herbaceous when young but soon becoming woody, villous and with glandular hairs in-

terspersed, green but becoming brownish with age. *Leaves* usually soft to the touch, indumentum extremely variable but always with glandular hairs; lamina panduriform to cordiform in outline, pinnatilobate to pinnatipartite with the segments occasionally shallowly lobed, adaxially glabrate to villous and green, abaxially sparsely villous to lanate and greyish-green, base cordate, apices of lobes obtuse, margins crenate, (20–) 35 (–60) × (15–) 25 (–75) mm; petiole (7–) 15 (–30) mm long, sparsely villous to villous; stipules triangular to cordiform, apices often 2- or more dentate, ca 6 × 5 mm. *Inflorescence*: flowering branches with normal and smaller foliar leaves; peduncles 20–80 mm long, distinctly articulated at distal and proximal ends in infructescences, villous to densely villous and interspersed with glandular hairs; involucre bracts lanceolate to ovate, often cuspidate, indumentum as on peduncles, 6–10 × 4–6 mm; pseudo-umbels with 2–20 relatively large flowers. *Pedicel* 1–3 mm long. *Hypanthium* 6–13 mm long, villous and with glandular hairs interspersed. *Sepals* lanceolate, apiculate, indumentum as on hypanthium, green to reddish-brown with white margins, 8–14 × 3–5 mm. *Petals* pale pink to pink; posterior two spatulate, apices obtuse to emarginate, with dark purple markings, reflexed at less than 90°, 20–35 × 6–13 mm; anterior three spatulate with long narrow claws, slightly reflexed, 15–28 × 5–10 mm. 2n=44. Fig. 11.



FIG. 11. — *Pelargonium panduriforme*. a, lowering branch, × 1; b, petals, × 1; c, androecium, × 2; d, gynoecium, × 3; e, pedicel, hypanthium and sepals, × 1. (From Van der Walt 890, cultivated in Stellenbosch.)

Diagnostic features

Erect, branched, strongly balm-scented, somewhat viscid shrub. Lamina panduriform to cordiform in outline, pinnatilobate to pinnatipartite, abaxially sparsely villous to lanate and greyish-green. Peduncles distinctly articulated, pseudo-umbels with 2–20 relatively large flowers each. Flowers pale pink to pink, pedicel shorter than hypanthium.

P. panduriforme occurs from Antoniesberg in the vicinity of Willowmore eastwards to near Riebeeck East, and it has also been collected near Engcobo in the Transkei (Fig. 12). It is extremely plentiful on the Baviaanskloof and Kouga Mountains where it grows on the lower foothills or ravines, often close to streams. The annual rainfall of the area in which it occurs is relatively low and it is spread throughout the year. The summers are very hot and frost occurs frequently during the winter months.

P. panduriforme flowers from August to January but the odd flower may be found throughout the year.

P. panduriforme is closely related to *P. quercifolium* (L.f.) L'Hérit. and the differences between these two species are tabulated under *P. quercifolium*. There is evidence that hybridization takes place between sympatric populations.

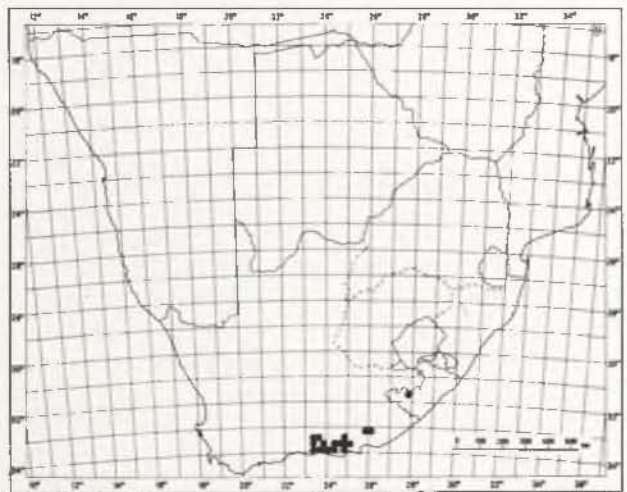


FIG. 12. — Known geographical distribution of *Pelargonium panduriforme*.

TRANSKEI. — 3127 (Lady Frere): near Engcobo (–DB), Acocks 13817 (PRE), Esterhuysen 29143 (BOL).

CAPE PROVINCE. — 3323 (Willowmore): Antoniesberg (–AD), Esterhuysen 24970, 24984 (BOL); Baviaanskloof (–BC), Bayliss 5586, 7707 (MO), s.n. (PRE), Esterhuysen 24986 (BOL; PRE); Bo Kouga (–CB), Bayliss s.n. (PRE); Kouga Mountains (–CB), Compton 10529 (NBG), Esterhuysen 4676 (BOL; GRA); near Misgund (–CD), Compton 7501 (BOL; NBG); Braamrivier (–DB), Esterhuysen 16307 (BOL); near Studtis (–DB), Olivier 1645 (STEU), Van der Walt & Vorster 1382 (STEU); Bruinklip (–DC), Van Breda 554 (PRE); Louterwater (–DC), Compton 4241 (BOL); Joubertina (–DD), Esterhuysen 6969, 21223 (BOL), 22795, 24240 (BOL; PRE), Long 1128 (PRE), Prosser 3323 (GRA), Van der Walt 682, 859 (STEU); Twee Riviere (–DD), Esterhuysen 7055 (BOL); Kromrivier (–DD), Ecklon & Zeyher 641 (MO; SAM), 3324 (Steytlerville): Cockscomb (–BD), Archibald s.n. (BOL); Kouga (–CB), Esterhuysen 4677, 6708 (BOL); Kougarivier (–CC), Compton 5296 (BOL); Assegaaibosch (–CD), Esterhuysen 6657 (BOL); Boplaas (–CD), Acocks 21281 (PRE); 40 km W of Patensie (–DA), Wurts 2105 (NBG);

Melkhoutboom (-DB), Long 1381 (PRE); De Mistkraal (-DB), Compton 23438, 24067 (NBG); near Combrink (-DD), Acocks 13695 (PRE), 3325 (Port Elizabeth); Ann's Villa (-BB), Bayliss 2948 (NBG), Taylor 9429 (PRE), Van der Walt 890 (STEU); Palmrietrivier Catchment (-CA), Scharf 1739 (PRE); Winterhoek Mountains (-CA), Ecklon & Zeyher 640 (M; MO; OXF; S; SAM), 3326 (Grahamstown); Mitford Park (-AA), Brink 98 (GRA).

6. *Pelargonium quercifolium* (L.f.) L'Hérit. in Ait., Hort. Kew. edn 1,2: 422 (1789), excl. var. α ; Salisb., Prodr.: 313 (1796) excl. L'Hérit., Geran. t. 14; Willd., Sp. Pl. 3: 678 (1800) p.p.; Pers. Syn. Pl. 2: 232 (1806) p.p.; Dietr., Lex. Gärt. 7: 49 (1807) p.p.; Willd., Enum. 2: 708 (1809) p.p.; Desf., Arb. 1: 462 (1809) p.p.; Ait. f., Hort. Kew. edn 2,4: 177 (1812) p.p.; DC., Prodr. 1: 678 (1824) p.p.; Steud., Nom. Bot. edn 2,2: 289 (1841) p.p.; Harv. in Fl. Cap. 1: 306 (1860) p.p.; Knuth in Pflanzenr. 4,129: 472 (1912) p.p. Type: Cape Province, 'Habitat in Cap. bonae Spei', Thunberg s.n. (UPS, holo.!).

Geranium quercifolium L.f., Suppl.: 306 (1781); Murray, Syst. Veg. 14: 619 (1784); Thunb., Prodr. 2: 115 (1800); Thunb., Fl. Cap. edn 2: 521 (1823) excl. ref. Cavanilles.

Pelargonium karrooense Knuth in Reprim. nov. Spec. Regni veg. 19: 231 (1932). Type: Cape Province, 'Grosse Karoo, Klipdrift', Schlechter 2278 (B+, holo.; Z, lecto.!).

P. quercifolium (L.f.) L'Hérit. var. *pinnatifidum* L'Hérit., Geran.: t. 15 (1792), name and illustration (description: L'Hérit. in Ait., Hort. Kew. edn 1,2: 322 (1789). Iconotype: L'Hérit., Geran.: t. 15 (1792).

Erect, much-branched, strongly balm-scented, viscid shrub, up to 1,75 m high and 0,75 m in diameter. Stems herbaceous when young but soon becoming woody, villous and densely interspersed with long glandular hairs, green but becoming brownish with age. Leaves hard to the touch (almost scabrous), strigose with a few long soft hairs in between and densely interspersed with long glandular hairs, green; lamina cordiform to triangular in outline, 3-palmatisect to pinnatisect, with the segments irregularly pinnatifid to pinnatisect, apices of segments acute to obtuse, margins irregularly dentate-serrate, (10-) 20 (-80) \times (12-) 25 (-70) mm; petiole (7-) 15 (-30) mm long, indumentum as on stems but with sharp, appressed stiff hairs in between; stipules triangular to cordiform, ca 4 \times 5 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 20-80 mm, distinctly articulated at distal and proximal ends in infructescences, villous and densely interspersed with long glandular hairs; involucre bracts broadly ovate, caudate, villous and with glandular hairs interspersed, 5-9 \times 5-7 mm; pseudo-umbels with 2-6 flowers each. Pedicel 1-2 mm long. Hypanthium 6-11 mm long, villous and densely interspersed with glandular hairs. Sepals lanceolate, apiculate, indumentum abaxially as on hypanthium, green to reddish-brown with white margins, ca 10 \times 3-5 mm. Petals pale pink to dark pinkish-purple; posterior two spatulate, apices obtuse to emarginate, with dark purple markings reflexed at less than 90°, 18-25 \times 5-8 mm; anterior three spatulate with long narrow claws, slightly reflexed, ca 20 \times 4-6 mm. 2n=44. Fig. 13.

Diagnostic features

Erect, much-branched, strongly balm-scented, viscid shrub. Lamina 3-palmatisect to pinnatisect



FIG. 13. — *Pelargonium quercifolium*. a, flowering branch, \times 1; b, petals, \times 1,5; c, androecium, \times 2; d, gynoecium, \times 2; pedicel, hypanthium, sepals and stamens, \times 1. (From Van der Walt 675, cultivated in Stellenbosch.)

with the segments irregularly pinnatifid to pinnatisect, almost scabrous. Peduncles distinctly articulated, pseudo-umbels with 2-6 flowers each. Flowers pale pink to dark pinkish-purple, relatively large, pedicel much shorter than hypanthium.

P. quercifolium is confined to the one degree squares which include the towns of Oudtshoorn and Willowmore (Fig. 14). The annual rainfall in these Karoo regions is relatively low and it is spread

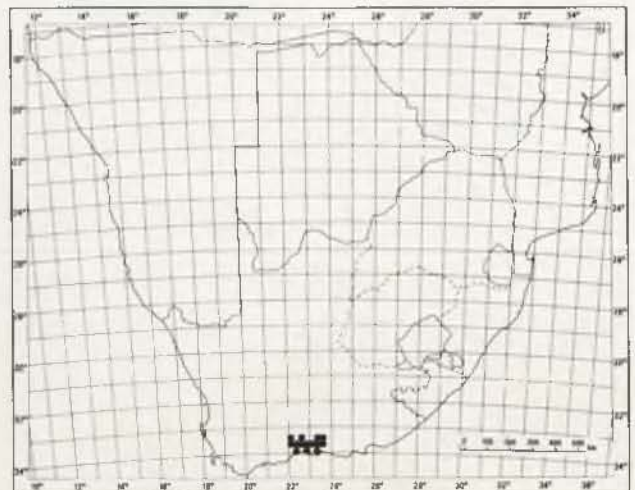


FIG. 14. — Known geographical distribution of *Pelargonium quercifolium*.

throughout the year. The summer temperatures are very high and frost occurs frequently during the mid-winter months. *P. quercifolium* is usually associated with fynbos vegetation and it is often found on rocky hills or mountain slopes in rhenosterbosveld. It is common along the road between Oudtshoorn and Willowmore where it grows on disturbed soil.

P. quercifolium flowers from August to January but the odd flower may be found throughout the year.

P. quercifolium and *P. panduriforme* Eckl. & Zeyh. are closely related species and the following characters can be used to distinguish between them:

<i>P. quercifolium</i>	<i>P. panduriforme</i>
1. Leaves 3-palmatisect to pinnatisect with the segments irregularly pinnatifid to pinnatisect.	1. Leaves pinnatifid to pinnatisect with the segments occasionally shallowly lobed.
2. Leaves almost scabrous and abaxially sometimes villous but never lanate.	2. Leaves usually soft to the touch and abaxially villous to lanate.
3. Leaves usually viscid.	3. Leaves occasionally somewhat viscid.
4. Pseudo-umbels with 2-6 flowers each.	4. Pseudo-umbels with 2-20 flowers each.
5. Posterior petals up to 25 mm long.	5. Posterior petals up to 35 mm long.

CAPE PROVINCE. — 3322 (Oudtshoorn): Fonteiplaas, Kango (-AC), Moffett 230 (STEU); Swartberg Pass (-AC), Schonland 272 (Z); near De Rust (-BC), Acocks 18284 (GRA; PRE); near Meiringspoort (-BC), Marloth 11325 (PRE); Rooikrantz near Oudtshoorn (-CA), Hops 2 (BOL); 18 km E of Oudtshoorn (-CB), Schonken 144 (STEU); near Camfer (-CD), Acocks 22859 (PRE), Esterhuysen 7112 (BOL), Schonken 204 (STEU), Van der Walt 675, 1139, 1308 (STEU); Klipdrift (-CD), Schlechter 2278 (Z); between Oudtshoorn and Montagu Pass (-CD), Bolus 14499 (BOL); near junction Oudtshoorn-George Road (-CD), Bayliss s.n. (PRE); Aangenaam (-DA), Van Niekerk 468 (BOL); below Kammanassieberg (-DB), Coppejans 1377 (WAG), Thompson 1378 (PRE); between Noll and Uniondale near Keurboomsrivier (-DD), Neser s.n. (STEU), 3323 (Willowmore): Willowmore (-AD), West 219 (BOL); Antoniesberg (-AD), Esterhuysen 24963 (BOL); Vaalwater (-AD), Van der Walt 725 (STEU); Georgida (-AD), Esterhuysen 6392 (BOL; PRE); 13 km from Willowmore to Uniondale (-AD), Van der Walt 702 (STEU); Baviaanskloof (-BC), Bayliss 7110, 7492 (MO), Boucher 31 (STEU), Gill s.n. (BOL); near Uniondale (-CA), Bolus 2278 (BOL; SAM), Marloth 10975 (PRE), Ryder 17 (BOL), Zinn s.n. (SAM); Uniondale Kloof (-CA), Esterhuysen 4699 (BOL); Potjieshoogte (-CA), Thompson 961 (PRE); 10 km W of Uniondale (-CA), Schonken 140 (STEU); 7 km from Uniondale to Willowmore (-CA), Van der Walt 723 (STEU); near Avontuur (-CA), Van der Walt 854 (STEU), Wells 2843 (GRA; PRE); 16 km W of Avontuur (-CA), Theron 1705 (PRE); Bo Kouga (-CB), Bayliss 7170 (MO); Onder Kouga (-CD), Bayliss 6032 (MO; NBG); Nuwekloof (-DA), Acocks 19909 (PRE).

7. *Pelargonium glutinosum* (Jacq.) L'Hérit. in Ait., Hort. Kew. edn 1,2: 426 (1789); Curtis in Curtis's bot. Mag. 3: t. 95 (1791); L'Hérit., Geran.: t. 20 (1792); Salisb., Prodr.: 314 (1796); Willd., Sp. Pl. 3: 676 (1800); Willd., Enum.: 707 (1809); Desf., Arb. 1: 462 (1809); Ait. f., Hort. Kew. edn 2,4: 176 (1812); DC., Prodr. 1: 679 (1824); Eckl. & Zeyh., Enum. 1:82 (1835); Harv. in Fl. Cap. 1: 306 (1860); Knuth in Pflanzenr. 4,129: 475 (1912). Type: 'Ex Africa est.', (W, holo.), specimen with Jacquin's handwriting).

Geranium glutinosum Jacq., Coll. 1: 85 (1787); Jacq., Icon. Pl. Rar. 1: t. 131 (1787).

G. viscosum Scop., Del. Fl. Faun. 2: 27, t. 14 (1786); Cav., Diss. 4: 246, t. 108, fig. 2 (1787); Thunb., Prodr. 2: 115 (1800). Iconotype: Scop., Del. Fl. Faun. 2: t. 14 (1786).

G. crataegifolium Roth, Bot. Abh.: 50, t. 9 (1787). Iconotype: Roth, Bot. Abh.: t. 9 (1787).

Pelargonium erectum Knuth in Bot. Jb. 44: 30 (1910); Knuth in Pflanzenr. 4, 129: 474 (1912). Type: Cape Province, Worcester, MacOwan 1705 (B+, holo.; SAM, lecto.); G!; GRA!; K!; W!; Z!).

Erect, much-branched, strongly balm-scented, viscid shrub, up to 1,8 m high and 1 m in diameter. Stems herbaceous when young but soon becoming woody, glabrous to villous but always with numerous glandular hairs, green but becoming brownish with age. Leaves glabrescent but with numerous glandular hairs, green to dark green; lamina cordiform in outline; 3-palmatifid to pinnatisect, basal segments often irregularly incised, base cordate, apices of segments acute, margins finely to coarsely dentate-serrate and with short sharp-pointed hairs, (15-) 50 (-120) × (12-) 55 (-130) mm; petiole (5-) 30 (-80) mm long, indumentum as on stems; stipules narrowly triangular to triangular, cuspidate, indumentum as on stems, ca 7 × 5 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 15-80 mm long, distinctly articulated at distal and proximal ends in infructescences, glabrous to sparsely villous but always with numerous glandular hairs; involucre bracts ovate, cuspidate, villous and densely interspersed with glandular hairs, 5-8 × 2-4 mm; pseudo-umbels with 1-8 flowers each. Pedicel 1 mm long. Hypanthium 3-10 mm long, villous and densely interspersed with glandular hairs. Sepals narrowly lanceolate to broadly spatulate, apiculate, indumentum abaxially as on hypanthium, green to reddish-brown with a white margin, ca 12 × 3-6 mm. Petals pale pink to dark pink; posterior two spatulate, apices obtuse, with dark pink-purple markings, reflexed at less than 90°, 12-25 × 5-8 mm; anterior three spatulate with long narrow claws, slightly reflexed, 12-25 × 4-8 mm. 2n=44. Figs 15, 16 & 17.

Diagnostic features

Erect, much-branched, strongly balm-scented, viscid shrub. Lamina 3-palmatifid to pinnatisect, glabrescent. Peduncles distinctly articulated, pseudo-umbels with 1-8 flowers each. Flowers pale pink to dark pink, pedicel shorter than hypanthium.

P. glutinosum occurs from Piquetberg in the south-western Cape to the Kei River in the eastern Cape. It is also known from a single locality in the Soutpansberg, northern Transvaal (Fig. 18). The distribution pattern is largely correlated to mountain ranges. It grows on well-drained soil in relatively moist habitats, often in close proximity to running water. In the Karoo regions of its distribution area with a low annual rainfall, it is confined to a mountainous habitat where the rainfall is considerably higher than in the surrounding lower-lying areas. The rainfall pattern seems to be of little significance as it occurs in winter rainfall regions, summer rainfall regions or in regions receiving rain throughout the year. Temperatures are high during the summer and frost is possible during the mid-winter in some of the inland localities.

P. glutinosum flowers sporadically throughout the year, but with a definite peak during the spring months of September and November.

It is an extremely variable species, both as far as the leaves and flowers are concerned. Three forms can be distinguished:

(a) Plants from the western part of the distribution area have deeply incised leaves and pale pink flowers. The flower buds are distinctly pear-shaped (Fig. 15). This form was described as *P. erectum* by Knuth in 1910. Plants from northern Transvaal show a strong resemblance to this form, although the flowers are smaller and the hypanthium, especially, is much shorter.

(b) Plants from the Karoo regions have less incised leaves and pink flowers (Fig. 16).

(c) Plants from the eastern part of the distribution area have shallowly incised leaves with dark pink flowers (Fig. 17).

The distribution of these three forms is by no means disjunct and a continuous variation pattern of leaf and floral characters occurs. It is therefore not possible to recognize infraspecific taxa although considerable differences exist between the extreme forms.

The leaves of *P. denticulatum* Jacq., *P. panduriforme* Eckl. & Zeyh. and *P. quercifolium* (L.f.) L'Hérit. are also viscid and emit the same balm scent as *P. glutinosum*. Inflorescence and floral characters indicate a very close relationship between *P. glutinosum* and *P. denticulatum*.



FIG. 16. — *Pelargonium glutinosum*. a, flowering branch, $\times 1$; b, petals, $\times 1.5$; c, androecium, $\times 2$; d, gynoecium, $\times 3$; e, pedicel, hypanthium and sepals, $\times 1$. (From Joubert s.n. (sub STEU 1007), cultivated in Stellenbosch.)



FIG. 15. — *Pelargonium glutinosum*. a, flowering branch, $\times 1$; b, petals, $\times 2$; c, androecium, $\times 2$; d, gynoecium, $\times 3$; e, hypanthium and sepals, $\times 1.5$; f, sepals, $\times 1.5$. (From Van der Walt & Vorster 1363, cultivated in Stellenbosch.)



FIG. 17. — *Pelargonium glutinosum*. a, flowering branch, $\times 1$; b, petals, $\times 1$; c, androecium, $\times 2$; d, gynoecium, $\times 3$; e, flower with petals removed. (From Schonken 139, cultivated in Stellenbosch.)

Geranium viscosum Cav. (1786) is an older name than *G. glutinosum* Jacq. (1787). However, this name cannot be applied to this species, because it represents a later homonym of *G. viscosum* Mill. (1768).

TRANSVAAL. — 2329 (Pietersburg): Happy Rest Nature Reserve (-BA), *Van der Walt & Vorster* 1363 (STEU).

CAPE PROVINCE. — 3123 (Victoria West): Hoekplaas, Murraysburg (-DD), *Acocks* 23527 (PRE). 3124 (Hanover): Wapadsberg Pass (-DD), *Acocks* 16215 (PRE), *Hall* 263 (NBG). 3126 (Queenstown): Rockwood, Queenstown (-DD), *Galpin* 2494 (PRE). 3218 (Clanwilliam): Moutonsvlei, Piquetberg (-DA), *Pillans* 7290 (BOL). 3224 (Graaff Reinet): farm Rietvlei, Graaff Reinet (-AB), *Galpin* 10006 (PRE); 40 km NW of Graaff Reinet (-AB), *Acocks* 17548 (PRE); Graaff Reinet (-BC), *Bolus* 40 (MEL; MO; PRE), *Bolus* 152 (SAM), *Page* 14392 (BOL); Plateau of Desolation (-BC), *Francis* 28 (BOL); Naudesberg Pass (-BC), *Moffett* 1020 (STEU); farm De Nek (-BC), *Olivier* 1672 (STEU); Oudeberg (-DD), *Bolus* s.n. (MO). 3225 (Somerset East): Buffelshoek Pass (-AC), *Acocks* 11973 (PRE). Mountain Zebra National Park (-AD), *Liebenberg* 7125 (PRE), *Muller* 605 (PRE; SRGH); Karreebosch, Cradock (-BA), *Long* 761 (PRE); Brintjieshoogte (-CB), *Scott Elliot* 557 (E); Boschberg, Somerset East (-DA), *MacOwan* 1728 (MEL; SAM); Ongegedd (-DA), *P.T. van der Walt* 334 (PRE). 3227 (Stutterheim): Windvoelberg, Cathcart (-AC), *Roberts* 1780 (PRE). 3228 (Butterworth): Kei River (-CA), *Ecklon & Zeyher* 643 (SAM). 3319 (Worcester): Hex River Pass (-BD), *Grant* s.n. (MO; PRE); Worcester (-CB), *MacOwan* 1705 (G; GRA; K; SAM; Z), *Marloth* 2304 (PRE); Keeromsberg (-DA), *Esterhuysen* 26595, 28160 (BOL). 3320 (Montagu): Kogmanskloof (-CC), *Acocks* 20344 (PRE), *Esterhuysen* 23809 (BOL; PRE), *Kuntze* s.n. (Z); Donkerkloof, Montagu (-CC), *Compton* 18471 (NBG); Montagu (-CC), *Kensit* 157 (BOL), *Page* 15644 (BOL); Tradouw Pass (-DC), *Barnard* s.n. (SAM), *Marsh* 693 (PRE), *Van der Walt* 826, 1294 (STEU); Rooihoogte Pass (-DC), *Boucher* 97 (STEU). 3321 (Ladismith): Buffelskloof near Ladismith (-AC), *Esterhuysen* 14009 (BOL); Seven Weeks Poort (-AD), *Compton* 7368 (NBG), *Neser* s.n. (STEU), *Schonken* 148 (STEU), *Van der Walt* 1113 (STEU); Toringberg (-AD), *Wurts* 1035 (NBG); Waterkloof near Ladismith (-BD), *Van der Walt* 626, 1119 (STEU); Kliphuisvlei (-BD), *Oliver* 5516 (PRE); 51 km from Muiskraal to Calitzdorp (-CB), *Admiraal* 207 (PRE); near Van Wyksdorp (-CB), *Van Breda* 746 (PRE); Garcia's Pass (-CC), *Acocks* 15437 (PRE), *Galpin* 3811 (GRA; PRE), *Johnson* 131 (NBG), *Van der Walt* 623, 1295 (STEU); Gamka Reserve near Calitzdorp (-DA), *Esterhuysen* 33855 (BOL); Rooihoogte Pass (-DA), *Compton* 3970 (BOL), *Oliver* 5310 (STE), *Van der Walt* 1302 (STEU). 3322 (Oudtshoorn): Swartberg Pass near Prince Albert (-AA), *Bolus* 11456 (BOL), *Hafström & Acocks* 1973 (PRE); Swartberg Pass (-AC), *Hutchinson* 1172 (PRE), *Van der Walt* 728, 1149, 1312 (STEU); Boomplaas, Kango (-AC), *Hugo* 32 (STEU); Schoemanskloof (-AD), *Venter* 7445, 7449 (STEU); Meiringspoort

(-BC), *Hafström & Acocks* 751 (PRE), *Van der Walt* 1140, 1144 (STEU); Blesberg (-BC), *Esterhuysen* 24896 (BOL); Oudtshoorn (-CA), *Hops* 2 (BOL); Groenkloof near Oudtshoorn (-CA), *Stärke* s.n. (BOL). 3323 (Willowmore): Blydeberg near Willowmore (-AA), *Andreae* 944 (PRE); Slypsteenberg (-AC), *Esterhuysen* 6319 (BOL), *Schonken* 139 (STEU); Hot Springs (-AC), *Fourcade* 6088 (BOL); Swanepoelspoortberg (-BB), *Marloth* 4133 (PRE). 3325 (Port Elizabeth): Gamtoosrivier (-CC), *Ecklon & Zeyher* 642 (SAM).

8. *Pelargonium denticulatum* Jacq., Hort. Schoenbr. 2: 5, t. 135 (1797); Willd., Sp. Pl. 3: 680 (1800); Pers., Syn. Pl. 2: 232 (1806); DC., Prodr. 1: 674 (1824); Ait., Hort. Kew. edn 2, 4: 179 (1812); Sweet, Geran. 2: 109 (1822); Eckl. & Zeyh., Enum. 1: 83 (1835); Harv. in Fl. Cap. 1: 307 (1860); Knuth in Pflanzenr. 4, 129: 476 (1912); Compton in Trans. R. Soc. S. Afr. 19: 294 (1931); J.J.A. v.d. Walt & Vorster, Pelarg. S. Afr. 2: 51, fig. (1981). Iconotype: Jacq., Hort. Schoenbr. 2: t. 135 (1797).

Geranium denticulatum (Jacq.) Poir., Encycl. Suppl. 2: 755 (1811). *Geraniospermum denticulatum* (Jacq.) Kuntze, Rev. Gen. 1: 94 (1891).

Erect, much-branched, balm-scented, viscid shrub, up to 2 m high and 1 m in diameter. Stems herbaceous when young but soon becoming woody, villous to hirsute and with numerous glandular hairs interspersed, dark green and sometimes flushed with purple, becoming brown with age. Leaves sparsely strigose but densely beset with glandular hairs, green; lamina pinnatisect to palmatisect with pinnatisect segments, base cordate, (40-) 60-80 (-100) × (45-) 70-90 (-110) mm, segments narrow and adaxially grooved, apices acute, margins irregularly denticulate, apices of teeth acute; petiole (25-) 50-60 (-90) mm long; stipules asymmetric-triangular, ca 6 × 2-5 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 20-60 mm long, distinctly articulated at distal and proximal ends in infructescences, sparsely villous to villous and with numerous glandular hairs interspersed; involucre bracts lanceolate to ovate, acuminate, indumentum as on peduncles, 4-7 × 2-3 mm; pseudo-umbels with 3-7 (-9) flowers each. Pedicel 1-2 mm long. Hypanthium 4-9 mm long, indumentum as on peduncles. Sepals lanceolate, acuminate, indumentum abaxially as on peduncles, green with a reddish-brown tint, 8-10 × 2-4 mm. Petals pinkish-purple; posterior two spatulate to obovate, apices obtuse to emarginate, with dark red to purple markings, reflexed at ca 90°, ca 20 × 6 mm; anterior three spatulate with narrow claws, reflexed at less than 90°, ca 14 × 4 mm. 2n=44. Figs 19 & 20.

Diagnostic features

Erect, much-branched, balm-scented, viscid shrub. Lamina pinnatisect to palmatisect with pinnatisect segments, segments narrow and adaxially grooved, apices acute, apices of teeth acute, sparsely strigose. Peduncles distinctly articulated, pseudo-umbels with 3-9 flowers each. Flowers relatively small, pinkish-purple, pedicel shorter than hypanthium.

P. denticulatum occurs in the south-western and southern Cape and it is known from Algeria near Clanwilliam south-eastwards to Baviaanskloof near

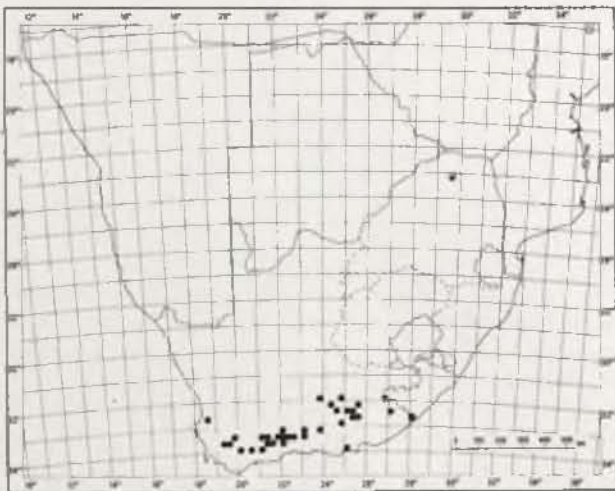


FIG. 18. — Known geographical distribution of *Pelargonium glutinosum*.



FIG. 19. — *Pelargonium denticulatum*. a, flowering branch, $\times 1$; b, petals, $\times 2$; c, androecium, $\times 3$; d, gynoecium, $\times 4$; e, sepals, $\times 2$. (From Van der Walt 728, cultivated in Stellenbosch.)



FIG. 20. — *Pelargonium denticulatum*. a, flowering branch, $\times 1$; b, petals, $\times 1.5$; c, androecium, $\times 2$; d, gynoecium, $\times 4$; e, schizocarp with mericarps, $\times 2$. (From Van der Walt 718, cultivated in Stellenbosch.)

Willowmore (Fig. 21). As in the case of so many other representatives of the section *Pelargonium*, this species is confined to mountains or their immediate vicinity, where the microclimate is considerably moister than in the neighbouring lower-lying areas. It is usually found in ravines and near streams. Its distribution area receives most of the rainfall during the winter months. Exact rainfall and temperature records for these mountainous areas are not yet available.

P. denticulatum flowers between April and November with a peak in September, and occasionally as late as the following January. Inflorescence and floral characters indicate a very close relationship between *P. denticulatum* and *P. glutinosum* (Jacq.) L'Hérit. The leaves of these two species are both viscid and they have the same balm scent. However, the leaves of *P. glutinosum* are less divided (pinnatisect) and the leaf segments consequently much wider than those of *P. denticulatum*.

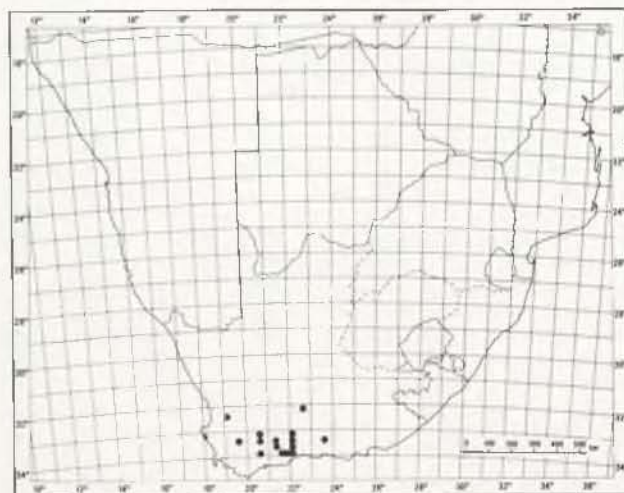


FIG. 21. — Known geographical distribution of *Pelargonium denticulatum*.

The leaves of *P. denticulatum* could also be confused with those of *P. radens* H.E. Moore. The differences between the leaves of these two species are tabulated under *P. radens*.

P. denticulatum was introduced into England from the Cape as early as 1789 by Masson, who was sent there to collect live plants for the Royal Botanic Gardens at Kew. According to Sweet, who published a description and a beautiful coloured illustration in his *Geraniaceae* 2: t. 109 (1822), it was cultivated in Kew until at least 1821 but there is no evidence that Jacquin obtained the material which he used to describe the species in 1797, from Kew. In the herbarium of the Naturhistorisches Museum in Vienna there are several specimens of *P. denticulatum*, but none has any inscription in Jacquin's handwriting, and there is also no evidence that he ever used any of these for his original description. It would be presumptuous, therefore, to consider any of them as the type specimen of *P. denticulatum*. For this reason, we consider it more prudent to recognize the illustration which accompanied the original description, as an iconotype.

CAPE PROVINCE. — 3219 (Wuppertal): Algeria (-AC), *Van der Walt* 743 (STEU); Middelberg, Cedarberg (-AC), *Kerfoot* 6108 (NBG). 3222 (Beaufort West): farm Donkerhoek, Nieuvels Mountains (-BA), *Liebenberg* 327 (PRE), 3319 (Worcester): Karoopoort (-BA), *Hutchinson* 449 (BOL), 3320 (Montagu): Witteberge, 16 km W of Laingsburg (-BA), *Fischer* 240 (STEU); Witteberg, Matjiesfontein (-BC), *Compton* 2568 (BOL), *Esterhuysen* 28880 (BOL), *Marloth* 2967 (BOL); Tradouw Pass (-DC), *Taylor* 394 (BOL), 3321 (Ladismith); Seven Weeks Poort (-AD), *Barker* 5457 (BOL; NBG), *Bayliss* 2438 (NBG; Z), *Esterhuysen* 24746 (BOL), *Marloth* 2947 (PRE), *Phillips* 1414 (PRE; SAM), *Rycroft* 2706 (NBG), *Salter* 3118 (BOL), *Taylor* 6966 (PRE), *Wells* 3758 (GRA; PRE), *Wisura* 1789 (NBG), *Wurts* 1009 (NBG); Waterkloof, Ladismith (-AD), *Stokoe* 1896 (PRE); Rooiberg (-CB), *Compton* 3916 (BOL); farm Langberg (-DC), *Van der Walt* 718 (STEU); N of Cloete's Pass (-DD), *Goldblatt* 4162 (MO; PRE); Cloete's Pass (-DD), *Muir* 1070 (BOL; PRE), *Schlieben & Ellis* 12357 (PRE; WAG), 3322 (Oudtshoorn); near Prince Albert (-AA), *Bayliss* 1945 (NBG; Z), *Marloth* 4473 (PRE); Schoemanspoort (-AC), *Britten* 1635 (GRA; PRE); Oudtshoorn (-CA), *Britten* 54 (GRA); Robinson Pass (-CC), *Middlemost* 2022 (NBG), 3323 (Willowmore); Baviaanskloof (-BC), *Bayliss* 5747 (MO; WAG; Z).

9. *Pelargonium pseudoglutiniosum* Knuth in *Reprrium* nov. Spec. Regni veg. 45: 64 (1938). Type: Cape Province, 'Distr. Uniondale, Long Kloof am Keurbooms River, 510 m', *Fourcade* 3388 (B⁺, holo.; BOL (Fourcade colln), lecto.!).

P. uniondalense Knuth in *Reprrium* nov. Spec. Regni veg. 28: 91 (1930); non Knuth loc. cit. 18: 135 (1918).

P. uniondalense Knuth var. *scabridum* Knuth in *Reprrium* nov. Spec. Regni veg. 28:91 (1930). *P. pseudoglutiniosum* Knuth var. *scabridum* (Knuth) Knuth in *Reprrium* nov. Spec. Regni veg. 45: 64 (1938). Type: Cape Province, 'Distr. Uniondale, zwischen Uniondale und Avontuur, 690 m', *Fourcade* 2922 (B⁺, holo.; BOL (Fourcade colln), lecto.!).

Erect to decumbent, much-branched, non-aromatic, viscid shrub, up to 1 m high and 1.25 m in diameter. *Stems* herbaceous when young but soon becoming woody, with numerous glandular hairs and long soft hairs in between, green but becoming wine-red and eventually brown with age. *Leaves* glabrescent to sparsely strigose and with glandular hairs, green but the larger veins adaxially often dark purple; lamina ovate in outline, pinnatifid to pinnatisect with the segments irregularly incised, base cuneate to obtuse, apices of segments acute, margins coarsely dentate and with short conical hairs, (20-) 35 (-50) × (15-) 25 (-40) mm; petiole 10-20 mm long; stipules triangular, cuspidate to subulate, sparsely hispid with glandular hairs interspersed, 6-8 × 2-4 mm. *Inflorescence*: flowering branches with normal and smaller foliar leaves; peduncles 5-25 mm long, distinctly articulated at distal and proximal ends in infructescences, with glandular hairs and long soft hairs in between; involucre bracts ovate, apiculate, with glandular hairs and long soft hairs on the margins, 3-5 × 3-4 mm; pseudo-umbels with 1-2 flowers each. *Pedicel* 1-2 mm long. *Hypanthium* 6-10 mm long, with many glandular hairs. *Sepals* lanceolate, cuspidate, abaxially with many glandular hairs, green to wine-red, ca 10 × 4-5 mm. *Petals* pale pink to pink; posterior two spathulate, apices obtuse to emarginate, with a dark pink blotch and purple markings, reflexed at ca 90°, 15-25 × 5-8 mm; anterior three spathulate with long narrow claws, slightly reflexed, ca 12-20 × 4-6 mm. 2n=44. Fig. 22.



FIG. 22. — *Pelargonium pseudoglutiniosum*. a, flowering branch, × 1; b, petals, × 1.5; c, androecium, × 3; d, gynoecium, × 3. (From *Van der Walt* 855, cultivated in Stellenbosch.)

Diagnostic features

Erect to decumbent, much-branched, non-aromatic, viscid shrub. Lamina pinnatifid to pinnatisect, glabrescent to sparsely strigose, larger veins adaxially often dark purple. Peduncles distinctly articulated, pseudo-umbels with 1-2 flowers each. Flowers pale pink to pink, pedicel shorter than hypanthium.

P. pseudoglutiniosum has a restricted distribution in the southern Cape, and it is only known from Mannetjiesberg, Keurboomsrivier, Uniondale and Prince Alfred's Pass (Fig. 23). It grows in ravines near streams on well-drained soil. Its distribution area receives an annual rainfall of approximately 200 mm which is evenly spread throughout the year. Temperatures are high during summer and frost occurs regularly during the winter.

P. pseudoglutiniosum flowers from September to January. The odd flower may be found throughout the year.

P. denticulatum Jacq., *P. glutinosum* (Jacq.) L'Hérit., *P. pseudoglutiniosum* and *P. quercifolium* (L.f.) L'Hérit. are the only species of the section with viscid leaves. The leaves of *P. pseudoglutiniosum* could be confused with those of *P. glutinosum*. *P. glutinosum*, however, has strongly aromatic leaves and lacks the purple veins which are often found in *P. pseudoglutiniosum*. The 1-2-flowered pseudo-umbels are the most reliable feature to dis-

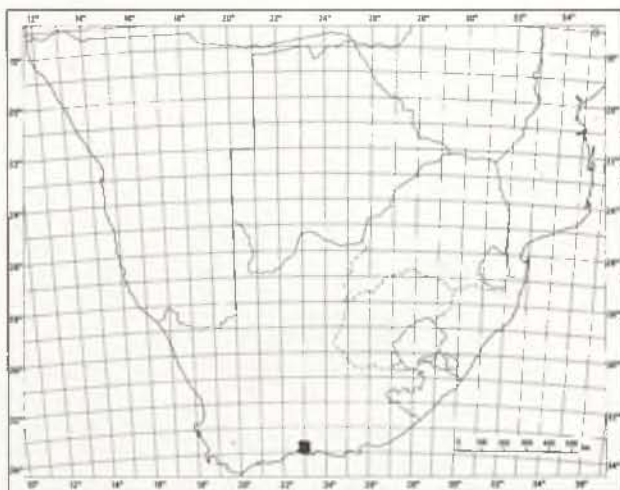


FIG. 23. — Known geographical distribution of *Pelargonium pseudoglutinosum*.

tinguish *P. pseudoglutinosum* from *P. glutinosum* which has more than two flowers per pseudo-umbel.

CAPE PROVINCE. — 3322 (Oudtshoorn): Mannetjiesberg (-DB), Esterhuysen 6490 (BOL); Keurboomsrivier (-DD), Fourcade 3388 (BOL). 3323 (Willowmore): Uniondale (-CA), Esterhuysen 16417 (BOL); 8 km S of Uniondale (-CA), Theron 1372 (PRE); Uniondale Poort (-CA), Van der Walt 855 (STEU); between Avontuur and Uniondale (-CA), Fourcade 2922 (BOL); Prince Alfred's Pass (-CC), Schonken 136 (STEU).

10. *Pelargonium graveolens* L'Hérit. in Ait., Hort. Kew. edn 1,2: 423 (1789); L'Hérit., Geran.: t. 17 (1792); Willd., Sp. Pl. 3: 678 (1800); Pers., Syn. Pl. 2: 232 (1806); Willd., Enum. 2: 708 (1809); Ait. f., Hort. Kew. edn 2,4: 178 (1812); DC., Prodr. 1: 678 (1824); Eckl. & Zeyh., Enum. 1: 82 (1835); Harv. in Fl. Cap. 1: 306 (1860); Knuth in Pflanzenr. 4,129: 475 (1912); Burt Davy, Fl. Transv.: 190 (1926); H.E. Moore in Bailey 3: 15 (1955); Muller in Fl. Zamb. 2,1: 147, t. 22 (1963); Batten & Bokelmann, Wild Flow. E. Cape: 88, fig. 74.3 (1966). Iconotype: L'Héritier, Geran.: t. 17 (1792).

Geranium graveolens (L'Hérit.) Thunb., Prodr. 2: 115 (1800); Thunb., Fl. Cap. edn 2: 522 (1823).

G. radula Roth, Bot. Abh.: 51, t. 10 (1787), non Cav. *Pelargonium asperum* Ehrh. ex Willd., Sp. Pl. 3: 678 (1800); Pers., Syn. Pl. 2: 232 (1806); Ait. f., Hort. Kew. edn 2,4: 178 (1812); DC., Prodr. 1: 679 (1824). *Geranium asperum* (Ehrh. ex Willd.) Poir., Encycl. Suppl. 2: 759 (1811). Iconotype: Roth, Bot. Abh.: t. 10 (1787).

G. terebinthinaceum Cav., Diss. 4: 250, t. 114, fig. 1 (1787), non Murray. *Geranospermum terebinthinaceum* (Cav.) Kuntze, Rev. Gen. 1: 94 (1891). *Pelargonium terebinthinaceum* (Cav.) Desf., Arb. 1: 462 (1809); Hanks & Small, N. Amer. Fl. 25: 24 (1907). Iconotype: Cavanilles, Diss. 4: t. 114, fig. 1 (1787).

P. intermedium Knuth in Bot. Jb. 44: 27 (1910). Syntypes: Cape Province, 'Howison's Poort', Schonland 614 (GRA, lecto.!, NH!; Z!); 'Kap der guten Hoffnung', Krebs s.n. (B+).

Erect, much-branched, strongly rose-scented shrub, up to 1,3 m high and 1 m in diameter. Stems herbaceous when young, becoming woody with age, villous to densely villous and densely interspersed with glandular hairs, green but becoming brownish with age. Leaves soft to the touch, indumentum variable but always with numerous glandular hairs; lamina cordiform in outline, palmatipartite to pinna-

tisect with the segments irregularly pinnatipartite to pinnatisect, adaxially sparsely villous to villous and green, abaxially villous to densely villous or almost lanate and greyish-green, base cordate, segments adaxially grooved, apices obtuse to acute, margins irregularly serrate and revolute, (20-) 40 (-55) × (30-) 60 (-100) mm; petiole (10-) 30 (-80) mm long; stipules asymmetric-triangular, cuspidate, ca 6 × 4 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 15-40 mm long, villous to densely villous and densely interspersed with glandular hairs; involucre bracts ovate to lanceolate, cuspidate, indumentum as on peduncles, 4-6 × 2-3 mm; pseudo-umbels with 3-5 (-7) flowers each. Pedicel 1-7 mm long. Hypanthium 4-15 mm long, indumentum adaxially as on peduncles, green to reddish-brown with a white margin, 8-11 × 2-3,5 mm. Petals white to pinkish-purple; posterior two spatulate, apices obtuse to emarginate, with wine-red feather-like markings, reflexed at ca 90°, 20-30 × 6-8 mm; anterior three spatulate to oblanceolate with narrow claws, reflexed at ca 45°, 17-22 × 4-5 mm. 2n=88. Fig. 24.



FIG. 24. — *Pelargonium graveolens*. a, flowering branch, × 1; b, petals, × 1; c, androecium, × 2; d, gynoecium, × 3. (From Van der Walt 690, cultivated in Stellenbosch.)

Diagnostic features

Erect, much-branched, strongly rose-scented shrub. Lamina palmatipartite to pinnatisect with irregularly pinnatipartite to pinnatisect segments, soft to the touch, margins of segments revolute. Pseudo-umbels with 3-5 (-7) white to pinkish-purple flowers each, pedicel usually shorter than hypanthium.

P. graveolens has two separate areas of distribution in southern Africa, one in the northern Transvaal and one in the south-eastern part of the Cape Province. It is also recorded from Zimbabwe and Mozambique (Fig. 25). In northern Transvaal it grows on mountains and occurs from Blouberg in the west to Wolkberg near Pilgrim's Rest in the east. In the Cape Province it occurs from near George in the west to Grahamstown in the east.

It is usually found in relatively moist habitats in semi-shaded situations. The populations in the northern Transvaal receive summer rain and those in the Cape Province rain throughout the year. The summers in both areas are hot to very hot and the winters mild.

One can only speculate that it had a continuous distribution in earlier times along mountain ranges from northern Transvaal to the Cape Province.

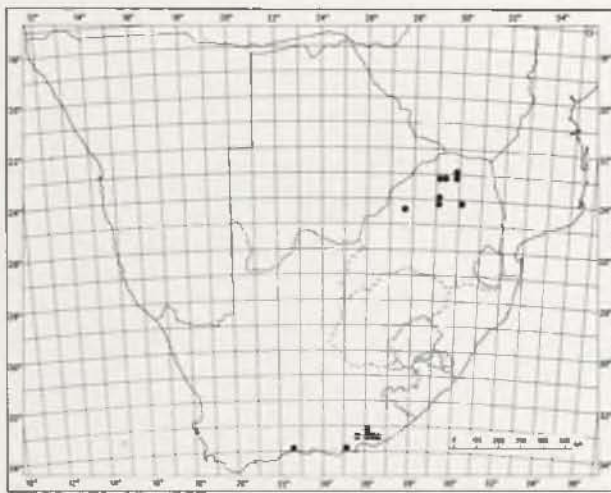


FIG. 25. — Known geographical distribution of *Pelargonium graveolens*.

P. graveolens flowers from August to January with a peak in September and October. However, the odd flower may be found throughout the year.

P. graveolens and *P. radens* H.E. Moore are two closely related species. Their floral structure is very similar and they have the same fragrance. They can only be distinguished on leaf characteristics, and these differences can be tabulated as follows:

<i>P. graveolens</i>	<i>P. radens</i>
1. Leaves villous and soft to the touch.	1. Leaves hirsute and almost scabrous.
2. Leaf segments at least 3 mm wide.	2. Leaf segments less than 3 mm wide.
3. Leaf margins less revolute.	3. Leaf margins more revolute.

TRANSVAAL. — 2229 (Waterpoort): 8 km W of Wyllie's Poort (-DD). Hutchinson & Gillett 4384 (BM). 2329 (Pietersburg): Blouberg (-AA), Esterhuysen 21440 (BOL; MO; PRE), Meeuse 10337 (PRE; SRGH), Strey & Schlieben 8507 (PRE; SRGH). Van der Schijff 5398 (PRE); Letsjume (-AB), Venter 6206 (PRE); Hanglip (-BB), Meeuse 10193 (PRE); 18 km W of Louis Trichardt (-BB), Prosser 2022 (PRE); Wolkberg (-CC), Leighton 3236 (BOL). 2427 (Thabazimbi): Krantzberg (-BC), Codd 4809 (PRE). Van der Merwe 2030 (PRE); farm Groothoek (-BC), Codd 3969 (PRE). 2429 (Zebediela): Makapaansberg

(-AA), Moffett 1741 (STEU). 2430 (Pilgrim's Rest); Wolkberg (-AA), Muller & Scheepers 153 (PRE).

CAPE PROVINCE. — 3322 (Oudtshoorn): Swarttrivier between George and Wilderness (-DC), Oosthuizen s.n. (STEU). 3325 (Port Elizabeth): Enon (-BC), Thode A2614 (NH; PRE); Lorie Plantation (-CC), Dix 4 (BOL). 3326 (Grahamstown): Riebeeck East (-AA), Bayliss 8067 (MO); near Alicedale (-AC), Bayliss 8098 (MO); Howieson's Poort (-AD), Barker 10612 (NBG), Britten 2553 (GRA), Leighton 3071 (BOL), Schonland 614 (GRA; NH; Z), Van der Walt 690 (STEU); Grahamstown (-BC), Bokelmann 3-PL13 (NBG), Daly & Sole 2709 (PRE), Galpin s.n. (GRA; PRE), MacOwan 813 (BOL; GRA; Z), MacOwan s.n. (BOL; MEL; SAM).

11. *Pelargonium radens* H.E. Moore in Bailey 3,1: 22 (1955); J.J.A. v.d. Walt, Pelarg. S. Afr. 1: 38, fig. (1977). Iconotype: Cavanilles, Diss. 4: t. 101, fig. 1 (1787).

Geranium radula Cav., Diss. 4: 262, t. 101, fig. 1 (1787); ?Curtis in Curtis's bot. Mag. 3: t. 95 (1789); Thunb., Prodr. 2: 116 (1800); Thunb., Fl. Cap. edn 2: 529 (1823); non Roth., Bot. Abh.: 51, t. 10 (1787). *Pelargonium radula* (Cav.) L'Herit. in Ait., Hort. Kew. edn 1.2: 423 (1789); Willd., Sp. Pl. 3: 679 (1800); Pers., Syn. Pl. 2: 232 (1806); Willd., Enum. 2: 709 (1809); Desf., Arb. 1: 462 (1809); Ait. f., Hort. Kew. edn 2.4: 178 (1812); DC., Prodr. 1: 679 (1824); Eckl. & Zeyh., Enum. 1: 82 (1835); Steud., Nom. Bot. edn 2.2: 289 (1841); Harv. in Fl. Cap. 1: 307 (1860); Knuth in Pflanzenz. 4,129: 477 (1912). *Geranospermum radula* (Cav.) Kuntze, Rev. Gen. 1: 95 (1891).

Geranium revolutum Jacq., Coll. 1: 84 (1787); Icon. Pl. Rar. 1: t. 133 (1787); non Andr., Bot. Rep. 5: t. 354 (1804). Iconotype: Jacquem., Icon. Pl. Rar. 1: t. 133 (1787).

Pelargonium multifidum Salisb., Prodr.: 313 (1796). nom. illegit.

Erect, much-branched, rose-scented shrub, up to 1,5 m high and 0,75 m in diameter. Stems herbaceous when young but soon becoming woody, sparsely to densely hirtellous and densely interspersed with glandular hairs, green but becoming brownish with age. Leaves hard to the touch (almost scabrous), hirsute and with glandular hairs interspersed, greyish-green to green; lamina palmatisect to pinnatisect with narrow, irregularly pinnatisect segments, segments adaxially grooved, apices usually obtuse, margins revolute, (20-) 45 (-85) × (25-) 70 (-150) mm; petiole (10-) 40 (-150) mm long; stipules asymmetric and narrowly triangular, hirtellous to villous and densely interspersed with glandular hairs, 4-6 × 2-3 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 12-20 mm long, sparsely to densely hirtellous and densely interspersed with glandular hairs; involucre bracts lanceolate, cuspidate, indumentum as on stipules, 4-6 × 2-3 mm; pseudo-umbels with 3-5 (-8) flowers each. Pedicel 2-10 mm long, indumentum as on stipules. Hypanthium 2-8 mm long. Sepals lanceolate, indumentum adaxially as on stipules, green to reddish-brown with white margins, ca 8 × 1,5-3,5 mm. Petals pale purple to pinkish-purple; posterior two spatulate, apices obtuse to emarginate, with dark wine-red feather-like markings, reflexed at ca 90°, ca 20 × 5 mm; anterior three spatulate with narrow claws, reflexed at ca 45°, ca 15 × 3,5 mm. 2n=88. Fig. 26.

Diagnostic features

Erect, much-branched, rose-scented shrub. Lamina palmatisect to pinnatisect, segments pinnatisect, narrow, apices usually obtuse, margins revo-



FIG. 26. — *Pelargonium radens*. a, flowering branch, $\times 1$; b, petals, $\times 1.5$; c, androecium, $\times 2$; d, gynoecium, $\times 3$. (From Ward-Hilhorst s.n. (sub STEU 1369), cultivated in Stellenbosch.)

lute, almost scabrous. Pseudo-umbels with 3–8 flowers each. Flowers pale purple to pinkish-purple, pedicel as long as hypanthium.

P. radens occurs from Tulbagh in the south-western Cape, eastwards along the coast to Engcobo in the Transkei (Fig. 27). It is particularly common in the coastal regions of the southern Cape. In the south-western Cape it receives winter rains, in the southern Cape winter as well as summer rains, and in the eastern Cape and Transkei predominantly summer rains. It is usually found in mountainous, rather moist habitats, but apart from the water requirements, it is apparently adapted to a wide range of climatic conditions especially as far as temperatures are concerned.

P. radens flowers from August to January with a peak during the spring months (September to October).

The leaves of *P. radens* resemble those of *P. denticulatum* Jacq. and the differences between the leaves of these two species can be tabulated as follows:

<i>P. radens</i>	<i>P. denticulatum</i>
1. Leaf segment margins revolute.	1. Leaf segment margins not revolute.
2. Apices of leaf segments usually obtuse.	2. Apices of leaf segments acute.
3. Leaves not viscid.	3. Leaves viscid.

Moore (1955) explained in detail why it was necessary to replace the old established name *P. ra-*

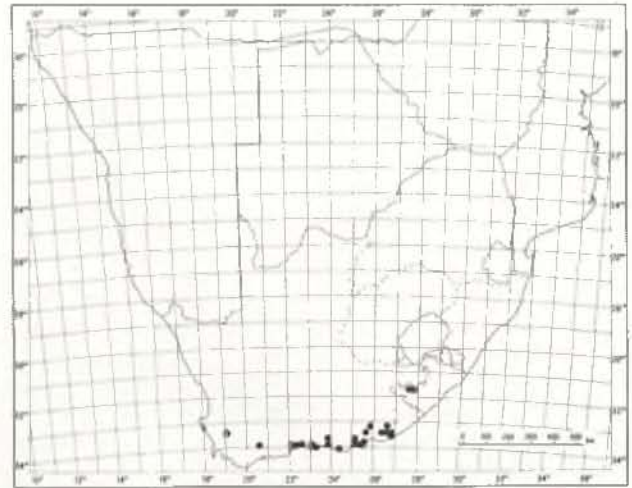


FIG. 27. — Known geographical distribution of *Pelargonium radens*.

dula with *P. radens*. The name *Geranium radula* Cav. is illegitimate since it was superfluous when published.

TRANSKEI. — 3127 (Lady Frere): near Cala (-DA), Flanagan 2628 (PRE; SAM), Bolus 8814 (BOL); Engcobo (-DB), Esterhuysen 29218 (BOL); Flanagan 2729 (PRE).

CAPE PROVINCE. — 3319 (Worcester): Waterfall, Tulbagh (-AC), Bolus s.n. (BOL), Ecklon & Zeyher 644 (SAM; W); 3320 (Montagu): Tradouw Pass (-DC), Hafström & Acocks 1981 (PRE), Wall s.n. (MO); 3322 (Oudtshoorn): Robinson Pass (-CC), Van der Walt 1153 (STEU); 10 km E of George (-CD), Schonken 187 (STEU); Saasveld (-DC), Oosthuizen s.n. (STEU), Schonken 188 (STEU); Kaaimansgat (-DC), Compton 15799 (NBG); 3323 (Willowmore): Keurboomsrivier (-CC), Esterhuysen 27351 (BOL); Prince Alfred's Pass (-CC), Horn s.n. (PRE); De Vlug (-CC), Van der Walt 845 (STEU); Braamrivier, Uniondale (-DB), Esterhuysen 16318 (BOL; NBG); Die Hoek near Joubertina (-DD), Esterhuysen 22791 (BOL); 3325 (Port Elizabeth): Suurberg Pass (-BB), Taylor 9426 (PRE); Olifantskop (-BC), Olivier 1700 (STEU); Farm Deyselskraal, Uitenhage (-CA), Scharf 1869 (PRE); Groendal, Wilderness (-CA), Scharf 1641 (PRE); Van Stadensrivier (-CC), Ecklon & Zeyher 645 (S; SAM; W); Van Stadensberg (-CC), Ecklon & Zeyher 2096 (S), Elliot 255 (E); 49 km from Port Elizabeth to Humansdorp (-CC), Stirton 6348 (MO; PRE); Bulkrivier Reservoir (-CC), Holland 3659 (BOL); Uitenhage (-CD), Zeyher 301 (SAM), Zeyher 319 (MEL); 24 km from Uitenhage on Elandsrivier road (-CD), Acocks 21073 (PRE); Kameahs (-CD), West 316 (BOL); Swartkopsrivier (-DC), Drège s.n. (SAM), Drège 7444 (E; K; MO; PRE; S; W); Walmer (-DC), Paterson 129 (Z); 3326 (Grahamstown): near Sidbury (-AD), Dyer 2233 (GRA); Coldspring (-AD), Rogers 3988 (Z); between Grahamstown and Assegaiibos (-AD), Ecklon & Zeyher 199 (PRE; SAM); Bothasberg (-BA), Ecklon & Zeyher 646 (K; MEL; MO; PRE; S; W; Z); Grahamstown (-BC), Bayliss 5275, 7507 (GRA; MO), Ecklon & Zeyher 2097 (GRA; W), MacOwan s.n. (BOL; GRA; MEL), MacOwan 460 (GRA; SAM; Z), Rogers 29470 (SAM; Z); 8 km from Grahamstown to Fort Beaufort (-BC), Stirton 6207B (PRE); Mountain Drive, Grahamstown (-BC), Bond 1245 (NBG); Farm Earls Rust near Grahamstown (-BC), Dyer 604 (PRE); Collingham Tower near Grahamstown (-BC), Leighton 3072 (BOL); Fraser's Camp Reserve near Grahamstown (-BD), Rhumane P. 29 (GRA); Longvale, De Kol (-DB), Grant 24 (GRA); 3423 (Knysna): Plettenberg Bay (-AB), Kapp 117 (PRE), Keet 1014 (GRA; PRE), Rogers 22320 (PRE), Rogers 26776 (Z), Taylor 6039 (NBG); 3424 (Humansdorp): Clarkson (-AB), Thode A758 (MO; NH; PRE).

12. *Pelargonium scabrum* (L.) L'Hérit. in Ait., Hort. Kew. edn 1,2: 430 (1789); Jacq., Icon. Pl. Rar. 3: 11, t. 542 (1789); Salisb., Prodr.: 313 (1796);

Willd., Sp. Pl. 3: 681 (1800); Pers., Syn. Pl. 2: 233 (1806); Desf., Arb. 1: 462 (1809); Ait. f., Hort. Kew. edn 2,4: 179 (1812); DC., Prodr. 1: 677 (1824); Spreng., Syst. Veg. 3: 60 (1826); Eckl. & Zeyh., Enum. 1: 81 (1835); Steud., Nom. Bot. edn 2,2: 289 (1841); Harv. in Fl. Cap. 1: 304 (1860); Knuth in Pflanzenr. 4,129: 462 (1912); J. J. A. v.d. Walt, Pelarg. S. Afr. 1: 42, fig. (1977). Lectotype: Specimen LINN 858.8 (LINN!), specific epithet in Linnaeus's handwriting.

Geranium scabrum L., Cent. Pl. 1: 281 (1755); L., Syst. Nat. 2: 1142 (1759); L., Amoen. 4: 281 (1759); Burm. f., Geran.: 34, t. 1 (1759); L., Sp. Pl. edn 2,2: 946 (1763); Burm. f., Prodr. Fl. Cap.: 18 (1768); Murray, Syst. Veg. 14: 613 (1784); Cav., Diss. 4: 247, t. 108, fig. 1 (1787); Jacq., Coll. 2: 327 (1789); Thunb., Prodr. 2: 115 (1800); Andrews, Geran. 1: C. ic (1805); Thunb., Fl. Cap. edn 2: 523 (1823). *Geraniospermum scabrum* (L.) Kuntze, Rev. Gen. 1: 95 (1891).

Pelargonium balsameum Jacq., Icon. Pl. Rar. 3: t. 543 (1794); Jacq., Coll. 5: 136 (1797); Willd., Sp. Pl. 3: 679 (1800); Pers., Syn. Pl. 2: 232 (1806); Willd., Enum. 2: 709 (1809); Ait. f., Hort. Kew. edn 2,4: 178 (1812); DC., Prodr. 1: 679 (1824). *Geranium balsameum* (Jacq.) Poir., Encycl. Suppl. 2: 754 (1811). *Pelargonium scabrum* (L.) L'Hérit. var. *balsameum* (Jacq.) Harv. in Fl. Cap. 1: 304 (1860); Knuth in Pflanzenr. 4,129: 462 (1912). Iconotype: Jacq., Icon. Pl. Rar. 3: t. 543 (1794).

Erect, often many-stemmed, soboliferous, usually much-branched, lemon-scented or non-aromatic shrub, up to 2,5 m high and 1,5 m in diameter. Stems herbaceous when young but soon becoming woody, strigose and with glandular hairs interspersed, green but becoming brownish with age. Leaves hard to the touch, scabrous, indumentum variable but always with glandular hairs, green; lamina rhomboidal in outline, 3-palmatilobate to 3-palmatisect with the segments irregularly incised, adaxially glabrescent to sparsely strigose, abaxially strigose, base cuneate, lateral segments often bifid and terminal segment often trifid, apices acute, margins finely to coarsely dentate-serrate, (20-) 40 (-100) × (10-) 40 (-110) mm; petiole (5-) 15 (-70) mm long, indumentum as on stems; stipules asymmetric-triangular, usually cuspidate, margins strigose, 5-10 × 3-8 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 6-50 mm long, sparsely strigose to strigose with glandular hairs interspersed; involucre bracts lanceolate to ovate, cuspidate, densely beset with glandular hairs and margins strigose, 3-10 × 1-5 mm; pseudo-umbels with 2-6 flowers each. Pedicel 3-12 mm long, sparsely strigose but densely beset with glandular hairs. Hypanthium 3-12 mm long, indumentum as on pedicel, purplish. Sepals lanceolate to spatulate, apiculate, indumentum abaxially as on pedicel, green to purplish, 7-12 × 2-4 mm. Petals white to purple to pinkish-purple; posterior two spatulate, sometimes emarginate, usually with feather-like dark purple markings, reflexed at ca 90°, 6-15 × 3-7 mm; anterior three narrowly oblanceolate to almost linear with narrow claws, slightly reflexed, 4-12 × 1,5-4 mm. 2n=22. Figs 28, 29 & 30.

Diagnostic features

Erect, soboliferous, lemon-scented or non-aromatic shrub. Lamina 3-palmatilobate to 3-palmatisect with the segments irregularly incised, scabrous. Pseudo-umbels with 2-6 flowers each. Flowers white



FIG. 28. — *Pelargonium scabrum*. a, flowering branch, × 1; b, petals, × 2; c, androecium, × 2; d, gynoecium, × 4; e, mericarp, × 2. (From Fischer s.n. (sub STEU 1925), cultivated in Stellenbosch.)



FIG. 29. — *Pelargonium scabrum*. a, flowering branch, × 1; b, petals, × 2; c, androecium, × 3; d, gynoecium, × 4; e, mericarp, × 3. (From Van der Walt 552, cultivated in Stellenbosch.)



FIG. 30. — *Pelargonium scabrum*. a. flowering branch, $\times 1$; b. petals, $\times 2$; c. androecium, $\times 2$; d. gynoecium, $\times 2$; e. flower with petals removed, $\times 1$. (From Van der Walt 511, cultivated in Stellenbosch.)

to purple to pinkish-purple, anterior three petals much narrower than two posterior ones, pedicel as long as hypanthium.

P. scabrum has a relatively large distribution area. It occurs from Steinkopf in the north-western Cape southwards along the west coast to the south-western Cape and from here eastwards to the district of Willowmore in the southern Cape. It usually grows in mountainous habitats on well-drained, sandy soil (Fig. 31). The western part of its distribution area receives winter rains while the eastern part receives rain throughout the year. Temperatures are high during the summer months and some of its habitats are covered with snow during the winter.

P. scabrum flowers from August to January although the odd flower may be found throughout the year.

P. scabrum is closely related to *P. ribifolium* Jacq. and the differences between them are discussed under the latter species. The leaves of *P. scabrum* resemble those of *P. citronellum* J. J. A. v.d. Walt, but the flowers of these two species differ markedly.

P. scabrum is a very variable species, especially as far as the structure of the leaves is concerned. The leaf segments of plants in the western Cape (Fig. 28) are much longer and narrower than those in the south-western and southern Cape (Fig. 30). The form with extremely narrow leaf segments (Fig. 29)

was described as *P. balsameum* by Jacquin (1794), and Harvey (1860) considered it as a variety of *P. scabrum*. Plants in the western Cape have purplish flowers, those in the south-western Cape pinkish-purple flowers and those in the southern Cape white flowers.

The extreme forms of *P. scabrum* differ to such an extent that one is tempted to distinguish infraspecific taxa. However, a detailed study of a large number of specimens from the entire distribution area revealed a continuous variation pattern of leaf and floral characters. This makes a delimitation of infraspecific taxa impossible.

P. scabrum hybridizes frequently in nature with other species of the section *Pelargonium*, and even with species of other sections (see list of hybrids at the end of this paper).

Linnaeus originally described *Geranium scabrum* in *Centuria* (1755). In this description the scabrous nature of *P. scabrum* is not mentioned, but there is nothing in the description which is not applicable to *P. scabrum*. Linnaeus considered *Geranium africanum* . . . of Plukenet (*Phytographia*: 169, t. 186, fig. 5 (1692)) as a possible synonym of *G. scabrum*. Unfortunately the identity of *G. africanum* . . . cannot be determined from the illustration, but it does not resemble *P. scabrum*.

It is strange that Linnaeus did not refer to the *Centuria* publication in his description of *G. scabrum* in *Systema Naturae* (1759). In this description the scabrous nature of the leaves is mentioned, leaving no doubt about Linnaeus's concept of the species.

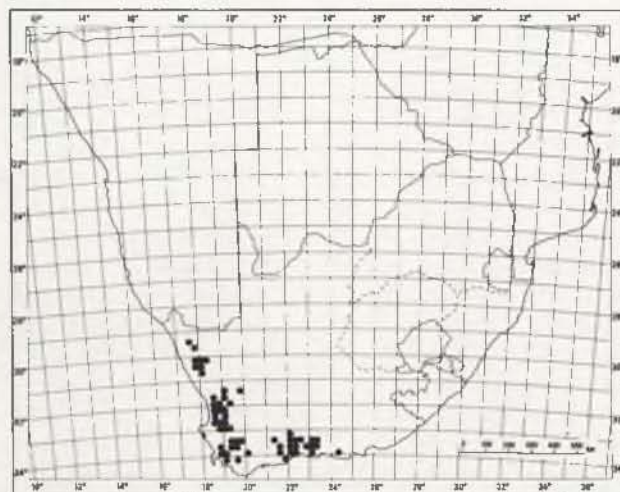


FIG. 31. — Known geographical distribution of *Pelargonium scabrum*.

CAPE PROVINCE. — 2917 (Springbok): 5 km S of Steinkopf (-BC). Taylor 1203 (BOL); 25 km W of Springbok (-DB). Acocks 19583 (PRE); near Nababiep (-DB). Van der Walt 1402 (STEU). 3017 (Hondeklipbaai): 6 km N of Bowedorp (-BB). Van der Walt 410 (STEU); Bowedorp (-BB). Van der Walt 557 (STEU); Kamieskroon (-BB). Thorne s.n. (SAM); 4 km E of Kamieskroon (-BB). Fischer 124 (STEU); 35 km S of Kamieskroon (-BD). Hardy & Bayliss 1094 (PRE; Z). 3018 (Kamiesberg); 10 km E of Kamieskroon (-AA). Lavranos 15162 (PRE); Ellenboog near Kamieskroon (-AA). Esterhuysen 23611 (BOL); Rooifontein, Kamiesberg (-AB). Adamson 1518 (PRE); Kamiesberg (-AC). Thorne s.n. (NBG); near Garies (-CA). Rodin 1430 (MO). 3118 (Vanrhynsdorp); Vanrhynsdorp (-DA). Van Breda

1394 (PRE). *Van der Walt* 552 (STEU); Gifberg (-DC). *Bayliss* 601 (PRE), *Esterhuysen* 21957 (BOL; PRE), *Phillips* 7594 (BOL; SAM). *Werdermann & Oberdieck* 523 (MO; PRE); Nardouw Mountains (-DC), *Barker* 4752, 7444 (NBG); Bulshoek (-DD), *Compton* 18841 (NBG), *Leighton* 2383 (BOL), 3119 (Calvinia); Nieuwoudtville (-AC), *Galpin* 11130 (PRE), *Van Son s.n.* (PRE); Vandrhyns Pass (-AC), *Hall* 962 (NBG), *Hardy* 778 (PRE; SRGH), *Taylor* 2869 (NBG); Glen Ridge (-AC), *Barker* 9638 (NBG); Calvinia (-BD), *Theiler* 79 (PRE); Lokenburg (-CA), *Acocks* 17232 (PRE), *Storj* 4285 (GRA; PRE); Botterkloof (-CD), *Barker* 10726 (MO; NBG), *Salter* 1657 (BOL), 3218 (Clanwilliam); Graafwater (-BA), *Thode* A1970 (MO); Clanwilliam (-BB), *Rogers* 16790 (Z); Pakhuis Pass (-BB), *Schlieben & Breda* 9883 (SRGH); Boschkloof (-BB), *Bond* 530 (NBG); Lambertshoekberg (-BC), *Maguire* 417 (NBG); Piquetberg (-DA), *Grant* 3439 (MO), *Guthrie* 2560 (NBG), *Martin* 899 (NBG), *Taylor* 3905 (PRE), *Theiler* 5 (PRE); Mouton's Vlei (-DA), *Marloth* 11489 (PRE), *Pillans* 7284, 7334 (BOL); De Hoek (-DA), *Barker* 2565 (NBG), *Compton* 19953 (NBG); Pienekierskloof (-DB), *Schlechter* 4965 (BOL; Z); Grey's Pass (-DB), *Ihlenfeldt* 1037 (PRE), *Steyn* 366 (NBG); Versfeld Pass (-DD), *Drijfhout* 1427 (STEU), *Liebenberg* 8354 (MO; PRE; SRGH), 3219 (Wuppertal); Krakadousberg (-AA), *Ecklon & Zeyher s.n.* (SAM), Middlemost 1859 (NBG); Algeria (-AC), *Storj* 2953 (PRE); Warm Baths near Citrusdal (-CA), *Pearson & Glover* 7061 (PRE); near Citrusdal (-CA), *Grant s.n.* (MO); Keerom (-CC), *Pillans* 8230 (PRE); Waboomsrivier (-CD), *Esterhuysen* 8940 (BOL), 3318 (Cape Town); Paarlberg (-DB), *Bolus* 2602 (BOL; SAM), *Volschenk* 31 (STEU); Bothmaskop, Stellenbosch (-DD), *Van der Walt* 511 (STEU); Stellenbosch (-DD), *Prior s.n.* (PRE; Z), 3319 (Worcester); Michell's Pass (-AD), *Bolus* 2602 (BOL), *Esterhuysen* 20722 (BOL), *Guthrie* 2403 (NBG), *Rehmann* 2347 (Z), *Van der Walt* 1284 (STEU), *Waigate* 369 (NBG); Mostertshock (-AD), *Wasserfall* 836 (NBG); Waaihoek (-AD), *Esterhuysen* 22243 (BOL); Matroosberg (-BC), *Phillips* 1948 (SAM); Hex River (-BD), *Esterhuysen* 21590 (BOL), *Lamb* 1299 (SAM), *Tyson* 7216 (PRE; SAM); Worcester (-CB), *Mac Owan s.n.* (SAM), *Marloth* 2305 (PRE), *Rehmann* 2457 (Z); Malkopkloof (-CB), *Esterhuysen* 3379 (BOL; PRE); Brandwacht Mountains (-CB), *Acocks* 15277 (PRE), *Van Breda* 751 (PRE); Audensberg (-CB), *Compton* 9790 (NBG); Groot Drakenstein Mountains (-CC), *Esterhuysen* 24030 (BOL); Sanddrift (-DA), *Schlieben & Van Breda* 9930 (PRE; SRGH), *Van der Walt* 535 (STEU); Sandhills (-DA), *Van der Walt* 634 (STEU), 3320 (Montagu); Kogmanskloof (-CC), *Ecklon & Zeyher* 634 (SAM), *Esterhuysen* 23808 (BOL); Montagu Baths (-CC), *Compton* 18360 (NBG), *Lewis* 1772 (SAM), *Page* 117 (PRE), *Page s.n.* (BOL), 3321 (Ladismith); Seven Weeks Poort (-AD), *Barker* 20597 (BOL), *Bayliss* 2442 (NBG; Z), *Gillet* 1701 (BOL), *Phillips* 1413 (SAM; Z), *Schonken* 147 (STEU), *Van der Walt* 630 (STEU), *Wells* 3757 (GRA; PRE); near Hoeko (-AD), *Wurts* 1481 (NBG); Rooiberg Pass (-DA), *Oliver* 5302 (PRE); farm Langberg (-DC), *Van der Walt* 837 (STEU); Cloete's Pass (-DC), *Golddblatt* 4163 (MO; PRE), 3322 (Oudtshoorn); Prince Albert (-AA), *Bolus* 10238 (NH), *Marloth* 4472 (PRE; STE), *Tugwell* 4 (BOL); Boomplaas (-AC), *Van der Walt* 403 (STEU); Swartberg Pass (-AC), *Hutchinson* 1174 (BOL), *Moffett* 700 (STEU), *Van der Walt* 727, 1311 (STEU); Schoemanshoek (-AD), *Barker* 67 (BOL), *Hops* 5 (BOL); Schoemanskloof (-AD), *Venter* 7443 (STEU); Meiringspoort (-BC), *Esterhuysen* 24885 (BOL), *Hafström & Acocks* 750 (PRE), *Van der Walt* 704, 1141 (STEU); Kamanassie Valley (-CA), *Fourcade* 3597 (PRE); 18 km E of Oudtshoorn (-CB), *Schonken* 143 (STEU); Robinson Pass (-CC), *Van der Walt* 1154 (STEU); Outeniqua Pass (-CD), *Lewis* 4370 (SAM); Klipdrift (-CD), *Schlechter* 2253 (BOL; Z); Camfer (-CD), *Schonken* 206 (STEU), *Van der Walt* 676, 1309 (STEU); Mannetjiesberg (-DB), *Esterhuysen* 6488 (BOL), 3323 (Willowmore); Slypsteenberg (-AC), *Schonken* 138 (STEU); Georgida (-AD), *Esterhuysen* 6377 (BOL; PRE); Modderfontein (-AD), *Andreae* 1045 (PRE; STE); Avontuur (-CA), *Bolus* 2279 (BOL), *Fourcade* 5851 (PRE); 8 km from Uniondale (-CA), *Theron* 1374 (BOL; PRE); Haarlem (-CB), *Schonland* 3083 (GRA; PRE); Prince Alfred's Pass (-CC), *Schonken* 135 (STEU), 3324 (Steytlerville); Suuransberg (-CD), *Wurts* 2062 (NBG), 3419 (Caledon); Botrivier (-AA), *Welman* 757 (BOL; GRA); near Genadendal (-BA), *Baur* 6607 (PRE), 3421 (Riversdale); Gourits River Bridge (-BB), *Galpin* 3813 (GRA; PRE).

Willd., *Sp. Pl.* 3: 677 (1800); Pers., *Syn. Pl.* 2: 232 (1806); Desf., *Arb.* 1: 460 (1809); Willd., *Enum.* 2: 708 (1809); Ait. f., *Hort. Kew.* edn 2,4: 177 (1812); DC., *Prodr.* 1: 671 (1824); Spreng., *Syst. Veg.* 3: 61 (1826); Eckl. & Zeyh., *Enum.* 1: 79 (1835); Steud., *Nom. Bot.* edn 2,2: 289 (1841); Harv. in *Fl. Cap.* 1: 305 (1860); Knuth in *Pflanzenr.* 4: 129: 459 (1912); J. J. A. v.d. Walt & Vorster in *Jl S. Afr. Bot.* 46: 289 (1980); J. J. A. v.d. Walt & Vorster, *Pelarg.* S. Afr. 2: 121, fig. (1981). Type: Cape Province, 'Ex Promontorio bonae Spei,' (W, holo.), specimen with Jacquin's handwriting).

Geranium ribifolium (Jacq.) Poir., *Encycl. Suppl.* 2: 754 (1812). *Geranospermum ribifolium* (Jacq.) Kuntze, *Rev. Gen.* 1: 95 (1891).

Pelargonium populifolium Eckl. & Zeyh., *Enum.* 1: 81 (1835); Knuth in *Pflanzenr.* 4: 129: 459 (1912). Type: Cape Province, '... laterum montium "Zuurberge" prope "Enon" (Uitenhage) eorumque ad "Langkloof" (Georg)' *Ecklon & Zeyher* 632 (S!; SAM!).

P. schonlandii Knuth in *Bot. Jb.* 44: 28 (1909); Knuth in *Pflanzenr.* 4: 129: 470 (1912). Type: Cape Province, 'Grahamstown Kloof bei Grahamstown', *Schonland* 568 (GRA!; NH!; PRE!; Z!).

Erect, much-branched, aromatic shrub, up to 2 m high and 1 m in diameter. *Stems* herbaceous when young but soon becoming woody, hirtellous and densely interspersed with glandular hairs, green. *Leaves* sparsely hirtellous to hirtellous and densely interspersed with glandular hairs, light green; lamina 3 (-5)-palmatilobate to 3 (-5)-palmatifid, base mostly cordate, apices of lobes mostly obtuse (rarely acute), margins dentate, (25-) 40-50 (-90) × (30-) 50-60 (-100) mm; petiole (20-) 40 (-100) mm long;



FIG. 32. — *Pelargonium ribifolium*. a, flowering branch, × 1; b, petals, × 2; c, androecium, × 2; d, gynoecium, × 3; e, flower with petals removed, × 2; f, mericarp, × 2. (From *Ward-Hilhorst* 207, cultivated in Kirstenbosch.)

13. *Pelargonium ribifolium* Jacq., *Icon. Pl. Rar.* 3: 11, t. 538 (1794); Jacq., *Coll. Suppl.* 5: 141 (1797);

stipules triangular to cordiform, acuminate, 5–11 × 2–8 mm. *Inflorescence*: flowering branches profusely branched, with normal and smaller foliar leaves; peduncles 30–40 mm long, hirtellous and densely interspersed with glandular hairs; involucre bracts lanceolate, acuminate, indumentum as on peduncles, 5–7 × 1–2 mm; pseudo-umbels with 6–12 flowers each. *Pedicel* 7–10 mm long, indumentum as on peduncles. *Hypanthium* 6–8 mm long, prominently thickened at the base. *Sepals* lanceolate, indumentum abaxially as on peduncles, green with a reddish tint, ca 10 × 2–5 mm. *Petals* white, posterior two obovate to obcordiform, apices obtuse to emarginate, with wine-red markings, reflexed at more than 90°, ca 17 × 11 mm; anterior three narrowly spatulate with narrow claws, occasionally with thin wine-red lines near bases, reflexed at less than 90°, ca 13 × 3 mm. 2n=22. Fig. 32.

Diagnostic features

Erect, much-branched, aromatic shrub. Lamina 3 (–5)-palmatilobate to 3 (–5)-palmatifid, hirtellous, apices of lobes mostly obtuse. Flowering branches profusely branched. Pseudo-umbels with 6–12 flowers each. Flowers white, anterior three petals much narrower than posterior two, hypanthium prominently thickened at base, pedicel as long as hypanthium.

P. ribifolium occurs in the eastern Cape Province, where it is particularly common, as well as in the southern Cape. It is found for more than 400 km from the Swartberg Pass in the Oudtshoorn district eastwards as far as the Katberg in the Fort Beaufort district (Fig. 33). The distribution pattern is largely correlated to the mountain ranges of the southern and eastern Cape. *P. ribifolium* occurs in fairly moist habitats, and this explains its distribution pattern as the rainfall in the mountains is higher than in the neighbouring lower-lying areas. A component of moist ravine vegetation, which usually consists of sclerophyllous shrub, the species is often associated with the margins of ravine forest. It grows in direct sunlight but is tolerant of shade and is frequently found in partially or even completely shady situa-

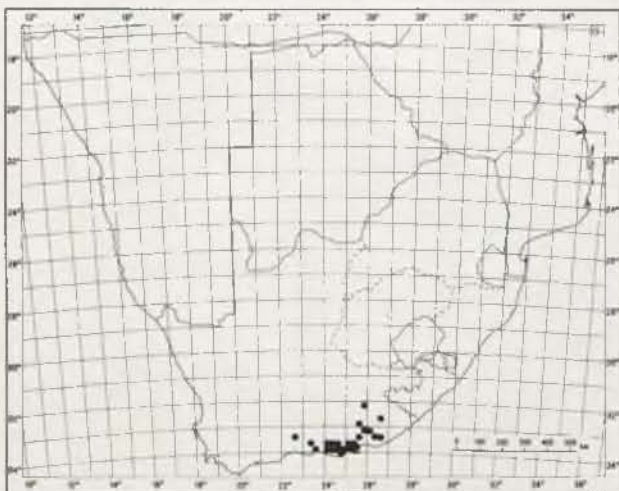


FIG. 33. — Known geographical distribution of *Pelargonium ribifolium*.

tions. The soil is usually well-drained, sandy and acid, often with a considerable amount of organic matter. The plants probably have a fairly constant supply of moisture throughout the year.

P. ribifolium flowers sporadically throughout the year, but especially during the spring months of September to November, with a peak in October.

P. ribifolium resembles *P. scabrum* (L.) L'Hérit. in its habit, and there is some resemblance in the shape of the leaves. The flowers of *P. scabrum*, however, are seldom white, and the thickening at the base of the hypanthium is less conspicuous. Furthermore, the lobes of the leaves are acute instead of obtuse, as is mostly the case in *P. ribifolium*.

CAPE PROVINCE. — 3225 (Somerset East): Elim (–BB), Schlechter 7736 (GRA; PRE; Z); Boschberg (–DC), Bolus 1752 (BOL), MacOwan 2214 (MEL; SAM). 3226 (Fort Beaufort): Katberg (–DA), Dyer 791 (GRA; PRE). 3322 (Oudtshoorn): Swartberg Pass, Wisura 1805 (NBG); Meiringspoort (–BC), Hafström & Acocks 750 (PRE). 3323 (Willowmore): Kouga Mountains (–CB), Esterhuysen 4675 (BOL); Tsitsikamma Mountains (–DC), Esterhuysen 22817 (BOL). 3324 (Steytlerville): Baviaanskloof (–CA), Bayliss s.n. (PRE), Esterhuysen 24985 (BOL; NBG; PRE); Baviaanskloof Mountains near Smitskraal (–CB), Thompson 1934 (STE); Kouga River Poort (–CC), Fourcade 3080 (STE); Suuranys (–CD), Bayliss s.n. (MO; PRE; WAG); 5 km from Kareedouw (–CD), Acocks 20036 (PRE); Cambria (–DA), Fourcade 5191 (PRE); between Cambria and Andrieskraal (–DA), Fourcade 2755 (MO; PRE); 58 km from Andrieskraal to Billson (–DC), Marsh 1392 (PRE; STE); Hankey (–DD), Long 1351 (PRE). 3325 (Port Elizabeth): between Ann's Villa and Zuurberg Inn (–BB), Van der Walt 701 (STEU); Zuurberg (–BC), Barker 4954 (NBG), Compton 20275 (BOL; NBG), Drège 7447 (S), Ecklon & Zeyher 632 (S; SAM), Van der Walt 886 (STEU); Sandrivier Reservation (–CA), Holland 3675 (BOL); Springfields (–CB), Paterson 930 (GRA); Otterford (–CC), Schonken 126 (STEU); Van Staden's Pass (–CC), Dahlstrand 2975 (GRA; PRE), West 387 (BOL); Witteklip (–CC), Rodin 1041 (BOL; MO); Loerie Plantation near Humansdorp (–CC), Dix 121 (BOL; GRA); Longmore Forest Reserve (–CC), Long 1035 (GRA; PRE); near Uitenhage (–CD), Ecklon & Zeyher 633 (S; SAM); Groendal near Uitenhage (–CD), Long 1158 (PRE); Baakensrivier, Fern Glen (–DC), Olivier 1228 (MO; NBG). 3326 (Grahamstown): Riebeeck-Oos (–AA), Bayliss 3587 (NBG; Z). Swartwatersberg (–AA), Acocks 12115 (PRE); Howieson's Poort (–AD), Britten 990 (GRA), Van der Walt 689 (STEU); Paradise kloof near Grahamstown (–AD), Britten 2629 (GRA); between Grahamstown and Assagaibosch (–AD), Ecklon & Zeyher 206 (BOL; PRE; SAM); Grahamstown (–BC), Britten 5131, 5166 (Z), Daly & Sole 330 (Z), Dyer 2150 (GRA; PRE), Galpin 158 (GRA; PRE), Rogers 27315 (BOL; GRA; SAM; Z), Rogers 28676 (Z), Schonland 568 (GRA; NH; PRE; Z), Sidey 1362, 3056 (PRE), Van Dam 22094 (PRE), Van der Walt 978 (STEU). 3424 (Humansdorp): Mistkraal (–BB), Compton 23436 (NBG); Cape St Francis (–BB), Bayliss s.n. (PRE).

14. *Pelargonium citronellum*, J.J.A. v.d. Walt in S. Afr. J. Bot. 2,1: 76, fig. 5 (1983). Type: Cape Province, between Riversdale and Herbertsdale near farm Langberg, Britz s.n. sub STEU 1082 (PRE, holo.!, K!; NBG!; STEU!).

Erect, much-branched, strongly lemon-scented shrub, up to 2m high and 1 m in diameter. *Stems* herbaceous when young but soon becoming woody, hirsute and with numerous glandular hairs, green but becoming brownish with age. *Leaves* sparsely hirsute to hispid and with numerous glandular hairs interspersed, green; lamina palmatifid to palmatisect with segments sometimes irregularly incised, conspicuously veined abaxially, base cuneate to cordate, apices of lobes acute, margins irregularly serrate-dentate, (35–) 50 (–110) × (25–) 55 (–130) mm; pe-

tirole (15–) 35 (–60) mm long; stipules narrowly triangular to triangular, 6–10 × 3–6 mm. *Inflorescence*: flowering branches profusely branched, with normal and smaller foliar leaves; peduncles 20–50 mm long, hirsute and with glandular hairs; involucre bracts narrowly ovate to ovate, apiculate, indumentum as on peduncles, 6–8 × 3–4 mm; pseudo-umbels with 5–6 (–8) flowers each. *Pedice*l 5–15 mm long, indumentum as on peduncles. *Hypanthium* 3–8 mm long. *Sepals* lanceolate, indumentum abaxially as on peduncles, green with a reddish-brown tint, ca 10 × 2–4 mm. *Petals* pinkish-purple; posterior two spatulate to obovate, apices obtuse to emarginate, with dark purple markings, reflexed at ca 90°, ca 20 × 8 mm; anterior three spatulate with narrow claws, reflexed at less than 90°, ca 20 × 4 mm. 2n=22. Fig. 34.



FIG. 34. — *Pelargonium citronellum*. a, flowering branch, × 1; b, petals, × 1.5; c, androecium, × 1.5; d, gynoecium, × 2. (From Van der Walt 1296, cultivated in Stellenbosch.)

Diagnostic features

Erect, much-branched, strongly lemon-scented shrub. Lamina palmatifid to palmatisect, sparsely hirsute to hispid. Flowering branches profusely branched. Pseudo-umbels with 5–8 pinkish-purple flowers each, pedicel usually longer than hypanthium.

P. citronellum is apparently confined to the one degree square which includes the town of Ladismith in the southern Cape (Fig. 35). It is common on the

northern foothills of the Langeberg Range between Muiskraal and Herbertsdale. As the case with many other representatives of the section *Pelargonium*, it is usually found near streams in well-drained sandy soil. The distribution area of *P. citronellum* receives most of its rainfall during the winter months.

P. citronellum flowers between August and January with a peak in September and October.

P. citronellum exhibits many leaf characters which are intermediate between those of *P. scabrum* (L.) L'Hérit, and *P. hispidum* (L.f.) Willd. The leaves of *P. citronellum* are less scabrous and more strongly lemon-scented than those of *P. scabrum*. Those of *P. hispidum* are aromatic but not lemon-scented, and less scabrous, than those of *P. citronellum*.

Most of the herbarium specimens of *P. citronellum* collected by previous workers, have been identified as *P. scabrum*. This error could be ascribed to the similarity which exists between the leaves of the two species. However, the flowers of these two species differ considerably. The flowers of *P. citronellum* are much larger and darker in colour than those of *P. scabrum*. The latter is a very variable species with a large distributional range stretching from the north-western Cape to the southern Cape. The southern Cape form of *P. scabrum* resembles *P. citronellum* much more than the western Cape form, and it is possible that *P. citronellum* evolved from this form. *P. scabrum* is also known as a species which hybridizes easily with other species, and it is therefore also possible that *P. citronellum* originated as a natural hybrid between *P. scabrum* and *P. hispidum*. A natural hybrid between *P. citronellum* and *P. hispidum* has been recorded (Van der Walt) 1124 in STEU).

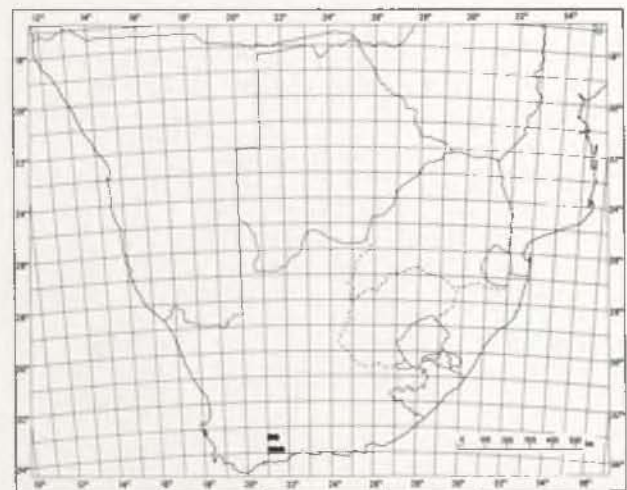


FIG. 35. — Known geographical distribution of *Pelargonium citronellum*.

CAPE PROVINCE. — 3321 (Ladismith): Buffelskloof near Ladismith (–AC), Esterhuysen 14008, 26833 (BOL); Seven Weeks Poort (–AD), Esterhuysen 24745 (BOL), Liebenberg 714 (PRE), Wells 3759 (PRE); Waterkloof near Ladismith (–AD), Hutchinson 1113 (BOL; K), Van der Walt 1120 (STEU); Muiskraal (–CC), Muir 2730 (PRE), Van der Walt 1296 (STEU); 12 km E of Muiskraal (–CD), Van der Walt 716 (STEU); Farm Langeberg (–DC), Britz s.n. (K; NBG; PRE; STEU), Van der Walt 835 (STEU).

15. *Pelargonium sublignosum* Knuth in Pflanzenr. 4,129: 460 (1912). Type: 'Sudwestliche Kap-provinz, Michell's Pass 660 m', Schlechter 9976 (B†, holo.; Z, lecto.!; BM!; BOL!; G!; GRA!; K!; P!; PRE!).

Erect, branched, strongly sweet-scented or non-aromatic shrub, up to 1 m high and 0,5 m in diameter. Stems herbaceous when young, becoming woody with age, sparsely to densely villous interspersed with glandular hairs and often shorter thicker hairs, green but becoming reddish-brown with age. Leaves sparsely hirtellous to villous (long soft hairs predominantly on veins of lamina) interspersed with glandular hairs, green to dull green; lamina cordiform in outline, 3-(5)-lobed, base cordate, apices of lobes obtuse to acute, margins dentate to coarsely dentate and often reddish, (20-) 35 (-60) × (25-) 40 (-80) mm; petiole (10-) 20 (-60) mm long; stipules ovate to cordiform, often apiculate, 5-10 × 3-10 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 20-40 mm long, sparsely villous to villous interspersed with glandular hairs and often shorter thicker hairs; involucral bracts lanceolate to cordiform, apiculate, glabrescent but margins with long hairs, 5-6 × 3-4 mm; pseudo-umbels with 3-9 flowers each. Pedicel 4-10 mm long, with glandular hairs, short hairs and sparsely interspersed with long hairs. Hypanthium 5-14 mm long, prominently thickened at base, indumentum as on pedicel. Sepals lanceolate, apiculate, indumentum abaxially as on pedicel, green with white margins, ca 9 × 3-4 mm.



FIG. 36. — *Pelargonium sublignosum*. a, flowering branch, × 1; b, petals, × 1,5; c, androecium, × 2; d, gynoecium, × 3. (From Van der Walt 591, cultivated in Stellenbosch.)

Petals white, light pink or pink; posterior two spatulate to obovate, with feather-like pinkish-purple markings, reflexed at ca 90°, ca 18 × 4-7 mm; anterior three narrowly spatulate with short narrow claws, slightly reflexed, ca 15 × 2 mm. 2n=22. Fig. 36.

Diagnostic features

Erect, branched, sometimes strongly sweet-scented shrub. Stems villous becoming reddish-brown with age. Lamina cordiform in outline, 3-(5)-lobed, sparsely hirtellous to villous, margins often reddish. Pseudo-umbels with 3-9 flowers. Flowers white, light pink or pink, pedicel usually slightly shorter than hypanthium.

P. sublignosum occurs in a relatively small area in the south-western Cape. It is confined to mountainous habitats and so far it has only been collected on Piquetberg and the mountain ranges between Porterville and Ceres (Fig. 37). This area falls entirely in the winter rainfall region. It grows in ravines or in other moist habitats, often between rocks. The soil in these situations consists of rather coarse, white sand. It is adapted to grow in a wide range of temperatures. Very high temperatures are experienced during summer and snow often occurs during winter.

P. sublignosum flowers from October to February with a peak in November and December. The odd flower is found throughout the year.

P. sublignosum exhibits a high degree of variation as far as fragrance and indumentum are concerned, especially of the stems and leaves, and the structure, colour and size of the flowers. This leaves the impression that it is possibly a relatively young species in the final stages of speciation. The leaves of *P. sublignosum* resemble those of *P. scabrum* (L.) L'Hérit., and it is possible that it evolved from this species. Natural hybrids between *P. sublignosum* and *P. scabrum* have been observed on the farm Grootfontein near Porterville. Hybrids between *P. sublignosum* and *P. grandiflorum* (Andr.) Willd. have also been reported from this area. The habit, leaves and indumentum of *P. sublignosum* show some resemblance to those of *P. scabroide* Knuth

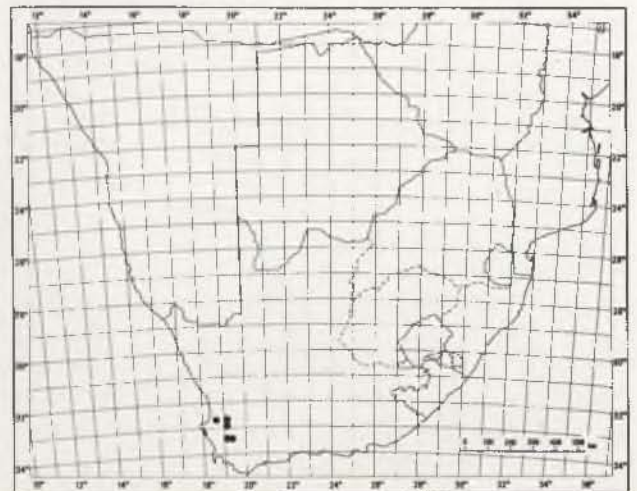


FIG. 37. — Known geographical distribution of *Pelargonium sublignosum*.

and *P. englerianum* Knuth, which may be indicative of a relationship between these species.

CAPE PROVINCE. — 3218 (Clanwilliam): Piquetberg (-DA). *Edwards 215* (Z). 3219 (Wuppertal): Elandsloof (-CA). *Smuts & Gillett 3479* (BOL); Hexberg (-CA). *Esterhuysen 18430* (BOL); Olifants River Mountains (-CC). *Esterhuysen 15339* (BOL); Twenty Four Rivers Mountains (-CC). *Esterhuysen 21906* (BOL; K; PRE); Farm Grootfontein near Porterville (-CC). *Van der Walt 591, 905* (STEU). 3319 (Worcester): Neethlingsberg, Witzenberg (-AC). *Esterhuysen 22513* (BOL; PRE); Mitchell's Pass near Ceres (-AD). *Compton 10061* (NBG). *Esterhuysen 14688* (BOL; PRE). *Schlechter 9976* (BM; BOL; G; GRA; K; P; PRE; Z). *Thode A2230* (PRE). *Van der Walt 1285* (STEU); Ceres (-AD). *Barker 8107* (NBG). *Esterhuysen 28416* (BOL). *Rogers 17600* (Z). *Van der Walt 581, 645* (STEU).

16. *Pelargonium scabroide* Knuth in Reprum nov. Spec. Regni veg. 18: 293 (1922). Syntypes: Cape Province, 'Gydow bei Ceres, auf den Abhängen der Skurfdeberg', *Bolus 1115* (BOL, lecto!; G!; SAM!; UPS!; W!); *Schlechter 9988* (BM!; BOL! p.p.; G! p.p.; K!; PRE! p.p.; S! p.p.; Z! p.p.); 'Constantiaberg', *Schlechter 877* (G!; P!; WU!; Z!).

Erect to decumbent, branched, non-aromatic subshrub, up to 0,75 m high and 0,5 m in diameter. Stems herbaceous when young, becoming woody with age, villous to hispid and with small glandular hairs in between, wine-red but becoming greyish-brown with age. Leaves hard to the touch (almost scabrous), green; lamina cordiform in outline, 3-palmatisect to pinnatisect with the segments irregularly incised, adaxially glabrescent, abaxially strigose to hispid and with small glandular hairs and sometimes long soft hairs in between, base cordate, apices of segments acute, margins coarsely serrate-dentate and wine-red, (12-) 25 (-45) × (15-) 30 (-55) mm; petiole (10-) 30 (-70) mm long, indumentum as on stems, wine-red; stipules triangular to cordiform, usually caudate, glabrescent but margins ciliate, ca 5 × 4 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 10-35 mm long, glabrescent to sparsely hispid with small glandular hairs and sometimes long soft hairs in between; involucre bracts lanceolate to cordiform, acuminate, glabrescent to hispid but margins ciliate, 4-7 × 2-3 mm; pseudo-umbels with 3-5 flowers each. Pedicel 4-10 mm long, sparsely hispid with small glandular hairs and sometimes long soft hairs in between. Hypanthium 6-10 mm long, prominently thickened at base, indumentum as on pedicel. Sepals lanceolate, apiculate, indumentum abaxially as on pedicel, green but becoming wine-red with age, ca 7 × 1,5-3 mm. Petals white to pale pink-purple; posterior two spatulate, with feather-like dark pink to wine-red markings, reflexed at ca 90°, ca 17 × 5 mm; anterior three narrowly spatulate with narrow claws, with a pink streak, reflexed at ca 45°, ca 12 × 2 mm. 2n=22. Fig. 38.

Diagnostic features

Erect to decumbent, branched, non-aromatic subshrub, young stems wine-red, villous to hispid. Lamina 3-palmatisect to pinnatisect with the segments irregularly incised, margins coarsely serrate-dentate and wine-red, almost scabrous. Pseudo-umbels with 3-5 flowers each. Flowers white to pale pink-purple with darker markings, pedicel as long as hypanthium.



FIG. 38. — *Pelargonium scabroide*. a, flowering branch, × 1; b, petals, × 2; c, androecium, × 2.5; d, gynoecium, × 3. (From Ward-Hilhorst 116, collected at Gydow Pass.)

P. scabroide has a relatively small distribution area. So far it has only been collected on the mountains between Porterville and Touws River (Fig. 39). It grows on coarse sandy soil in the shade of overhanging sandstone boulders which create rather moist habitats. The distribution area is situated entirely in the winter rainfall region. Snow falls occur regularly during the winter and the summers are very hot and dry.

Contrary to most species of the section *Pelargonium* which usually flower from spring to early summer, *P. scabroide* flowers during the hot summer months. Its flowering period has been recorded as from November to February.

The wine-red young stems with long hairs and typical leaf structure of *P. scabroide* distinguish it from other species of the section. *P. scabroide* has many characters in common with *P. sublignosum* Knuth and *P. englerianum* Knuth, and they undoubtedly are closely related. It is, however, easy to distinguish between these three species by leaf characters.

Nine specimens of *Schlechter 9988* (cited by Knuth as a type) have been studied. Two of these specimens consist of *P. scabroide* material only, and five consist of a mixture of *P. scabroide* and *P. englerianum*. The last two specimens, housed in MO and W, consist entirely of *P. englerianum* material.

The locality of *Schlechter 877* (also cited by Knuth as a type), is given as 'Constantiaberg'. This locality on the Cape Peninsula is doubtful, and it can most

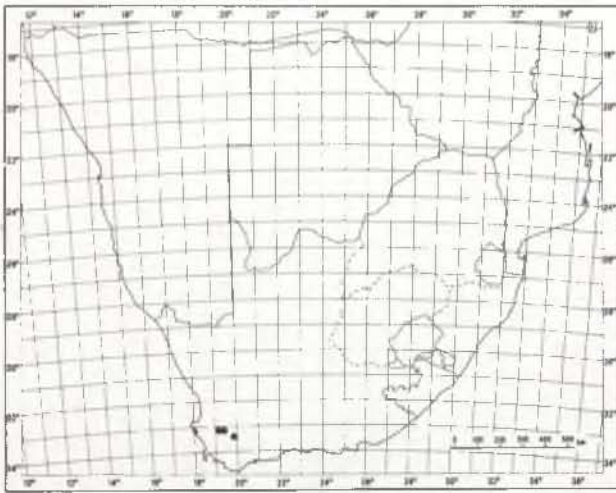


FIG. 39. — Known geographical distribution of *Pelargonium scabroide*.

probably be ascribed to an error on the part of Schlechter: apparently Schlechter did not keep a register for specimens below No. 1700 (Jessop, 1964).

CAPE PROVINCE. — 3319 (Worcester): farm Suurvlaakte near Porterville (-AA). *Van der Walt 1071* (STEU); Groot Winterhoek (-AA). *Van der Walt 1077* (STEU); between Rosendalfontein and Visgat (-AA). *Pillans 9664* (BOL); Visgat near Witzenberg (-AA). *Esterhuysen 13433* (BOL); east slopes of Witzenberg (-AA). *Esterhuysen 28405* (BOL). *Pillans 9634* (BOL); Skurfteberg (-AB). *Taylor 8670* (PRE); Gydo (-AB). *Bolus 1115* (BOL: G; S; SAM; UPS; W), *Schlechter 9988* (BM; BOL p.p.; G p.p.; K; PRE p.p.; S p.p.; Z p.p.). *Van der Walt 1288* (STEU); between Gydo and Witzenberg (-AB). *Isaac s.n.* (BOL). *Van der Walt 578* (STEU); Bokkerivier Farms (-BD). *Booyesen 62* (NBG).

17. *Pelargonium englerianum* Knuth in Pflanzenz. 4, 129: 470 (1912). Type: Cape Province, Prince Albert, Swartberg Pass, *Bolus 11452* (BOL, holotype!).

Erect to decumbent, much-branched, rose-camphor-scented subshrub, up to 1 m high and 0,75 m in diameter. Stems herbaceous when young, becoming woody with age, often long and slender, villous and densely interspersed with glandular hairs, green but soon becoming purplish and eventually brown. Leaves hispid and densely interspersed with glandular hairs, green; lamina reniform, sometimes 3-palmatilobate to 3-palmatisect, more or less crisped, base truncate to cordate, apices of lobes obtuse to acute, margin coarsely dentate, (5-) 15 (-35) × (5-) 20 (-40) mm; petiole (3-) 15 (-40) mm long, indumentum as on stems; stipules cordiform, often apiculate, ca 4 × 4 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 10-40 mm long, villous to hispid with glandular hairs interspersed; involucre bracts ovate to cordiform, apiculate, 4-5 × 3-4 mm; pseudo-umbels with 2-5 flowers each. Pedicel 6-20 mm long, sparsely hispid to hispid and with glandular hairs interspersed. Hypanthium 1-10 mm long, prominently thickened at the base. Sepals narrowly ovate to lanceolate, indumentum abaxially as on pedicel, green with white margins, ca 6-10 × 2-4 mm. Petals white to pinkish-purple; posterior two spatulate, with feather-like dark purple markings, reflexed at ca 90°,



FIG. 40. — *Pelargonium englerianum*. a, flowering branch, × 1; b, petals, × 2; c, androecium, × 2; d, gynoecium, × 4. (From Stirton 9456, cultivated in Stellenbosch.)

10-18 × 4-8 mm; anterior three oblanceolate with narrow claws, slightly reflexed, 7-12 × 2-4 mm. 2n=22. Fig. 40.

Diagnostic features

Erect to decumbent, much-branched, rose-camphor-scented subshrub, young stems purplish and villous. Lamina reniform, more or less crisped, hispid. Pseudo-umbels with 2-5 flowers each. Flowers white to pinkish-purple, relatively small, pedicel longer than hypanthium.

P. englerianum occurs from Lokenburg near Calvinia south-eastwards to the Swartberg Pass near Prince Albert (Fig. 41). It is extremely plentiful in the Cedarberg Mountains where it grows on coarse sandy soil, often in the shade of overhanging sandstone boulders. The distribution area falls entirely in the winter rainfall region. The summers are very hot and dry, and snowfalls occur regularly during the winter months.

P. englerianum flowers from August to April with a marked peak during the summer months November-January.

In the past, most herbarium specimens of *P. englerianum* have been erroneously identified as *P. crispum* (Berg.) L'Hérit. These errors can be ascribed to the similarities which exist between the leaves of the two species. The differences between *P. englerianum* and *P. crispum* are tabulated under the latter species.

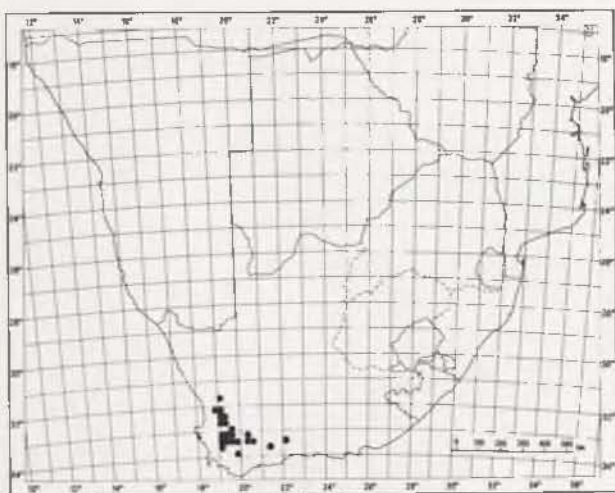


FIG. 41. — Known geographical distribution of *Pelargonium englerianum*.

Floral and vegetative characteristics indicate a relationship between *P. englerianum*, *P. scabroide* Knuth and *P. sublignosum* Knuth.

CAPE PROVINCE. — 3119 (Calvinia): Lokenburg (-CA), *Acocks* 17554 (PRE), 3218 (Clanwilliam): Boskloof, Cedarberg Mountains (-BB), *Esterhuysen* 7594 (BOL; PRE); Clanwilliam (-BB), *Pocock* 58 (PRE), 3219 (Wuppertal): Krakadouw Peak (-AA), *Esterhuysen* 7499 (BOL), *Stokoe* s.n. (SAM); road to Heuningvlei (-AA), *Esterhuysen* 21128 (BOL; NBG), *Middlemost* 1907 (NBG), *Stokoe* s.n. (SAM); Scorpion's Poort (-AA), *Esterhuysen* 7527 (BOL); Pakhuis Pass (-AA), *Esterhuysen* 3381, 7408, 21153, 21926 (BOL), *Galpin* 11207 (PRE), *Wisura* 746 (NBG); Uitkyk Pass (-AC), *Leipoldt* s.n. (BOL), *Van der Walt* 1418 (STEU); Cedarberg Mountains (-AC), *Stokoe* 7315 (BOL), *Stokoe* s.n. (SAM); Tafelberg (-AC), *Burnard* s.n. (SAM); Scderhoutkloof (-AC), *Esterhuysen* 20047 (BOL; NBG), *Taylor* 6183 (PRE); Duikerfontein (-AC), *Schonken* 82 (STEU); Algeria (-AC), *Esterhuysen* 7167 (BOL); Middelburg (-AC); *Acocks* 19856 (PRE), *Esterhuysen* 2784, 7166, 7280 (BOL), *Stokoe* s.n. (SAM); Maltese Cross (-AC), *Esterhuysen* 17994 (BOL); Driehoek Valley (-AC), *Esterhuysen* 22421 (BOL; PRE); Hoogvertoon (-AC), *Haynes* 1204 (PRE; STE); Wuppertal (-AC), *Thode* A1969 (PRE); Wolfberg (-AD), *Esterhuysen* 22425 (BOL; PRE); Elandskloof (-CA), *Lewis* 22058 (BOL); Grootberg (-CA), *Esterhuysen* 4150 (BOL); Duivelskop (-CA), *Stokoe* s.n. (SAM); Donkerkloofkop (-CA), *Stokoe* s.n. (SAM); Sandfontein (-CB), *Rycroft* 2642 (NBG), *Van der Walt* 1409 (STEU); Zuurvlakte (-DC), *Esterhuysen* 12708 (BOL), 3319 (Worcester); Rosendalfontein (-AA), *Pillans* 9663 (BOL; PRE); near Gydo (-AB), *Van der Walt* 644 (STEU); Agter-Witsenberg (-AB), *Marais* 46 (STEU); Koue Bokkeveld (-AB), *Adamson* 1566 (PRE); Skurfteberg (-AB), *Edwards* 87 (BOL); Buffelshoek Pass (-AC), *Marsh* 46 (PRE); near Prince Alfred Hamlet (-AD), *Marais* 39 (STEU); Ceres (-AD), *Rogers* 17575 (Z); Ertjieslandkloof (-AD), *Leighton* 2270 (BOL); Valsgatklouf (-AD), *Esterhuysen* 1531 (BOL); Merino (-AD), *Cillie* s.n. (STEU); Katbakkies Pass (-BA), *Taylor* 6097 (PRE); Roodeberg (-BC), *Compton* 8379 (NBG), *Esterhuysen* 20917 (BOL); Matroosberg (-BC), *Esterhuysen* 28628 (BOL), *Phillips* 1952 (SAM); Orchard (-BC), *Esterhuysen* 10907 (BOL); near Karoopoort (-BC), *Stokoe* s.n. (SAM); near Osplaats (-BC), *Rogers* 16720 (BOL; Z); Hex River Valley (-BD), *Tyson* 738 (BOL; MO; SAM); Bonteberg (-BD), *Compton* 9943 (NBG), *Esterhuysen* 3663, 3723 (BOL; NBG); Slanghoek Needle (-CA), *Esterhuysen* 17774 (BOL); between McGregor and Stormsvlei (-DD), *Esterhuysen* 4302 (BOL), 3320 (Montagu); Tweedside (-AB), *Marloth* 10805 (PRE); Witteberg (-AD), *Esterhuysen* 28877 (BOL); Fisantekraal (-BC), *Compton* 21117 (BOL; NBG), 3321 (Ladismith); Rooiberg (-CB), *Oliver* 5414 (STE), 3322 (Oudtshoorn); Swartberg Pass (-AC), *Bolus* 11452 (BOL), *Moffett* 701 (STEU).

18. *Pelargonium greytonense* J. J. A. v.d. Walt in JI S. Afr. Bot. 3:256-258 (1984) Type: Cape

Province, Happy Valley near Greyton, *Esterhuysen* 20755 (BOL, holo.!: K!; PRE!).

An erect, much-branched, non-aromatic to aromatic shrub, up to 1 m high and 0.75 m in diameter. *Stems* herbaceous when young but soon becoming woody, hirtellous and with a few long soft hairs and glandular hairs interspersed, green but becoming greyish-brown with age. *Leaves* hirtellous and with long hairs and many glandular hairs interspersed, green; lamina cordiform to palmatipartite, conspicuously veined, base cordate, apices of lobes obtuse, margin coarsely dentate, (15-) 35 (-60) × (20-) 40 (-70) mm; petiole (20-) 50 (-80) mm long; stipules cordiform to triangular, apiculate to cuspidate, 4-8 × 4-6 mm. *Inflorescence*: flowering branches with normal and smaller foliar leaves, peduncles 10-70 mm long, hirtellous to hirsute and densely interspersed with glandular hairs; involucre bracts ovate to narrowly ovate, cuspidate, indumentum as on peduncles, 4-8 × 4-5 mm; pseudo-umbels with 2-9 flowers each. *Pedicel* 8-20 mm long, relatively thin, indumentum as on peduncles. *Hypanthium* 3-8 mm long, prominently thickened at the base. *Sepals* 5, lanceolate, cuspidate, indumentum abaxially as on peduncles, green, ca 12 × 2-4 mm. *Petals* 5, white to pale pink; posterior two spatulate to obovate, apices obtuse, with dark red markings, reflexed at more than 90°, ca 20 × 8 mm; anterior three narrowly spatulate with short claws, reflexed at less than 90°, ca 18 × 2-3 mm. 2n=22. Fig. 42.



FIG. 42. — *Pelargonium greytonense*. a, flowering branch, × 1; b, petals, × 2; c, androecium, × 2; d, gynoecium, × 3; e, flower with petals removed, × 1. (From *Van der Walt* 520, cultivated in Stellenbosch.)

Diagnostic features:

Erect, much-branched, non-aromatic to aromatic shrub. Lamina cordiform, shallowly 3–(5–8)-palmatilobate to palmatipartite, hirtellous and with long hairs interspersed. Pseudo-umbels with 2–9 flowers each. Flowers white to pale pink, anterior three petals much narrower than posterior two, pedicel relatively thin and longer than hypanthium.

P. greytonense flowers between September and January with a peak in October and November.

P. greytonense is restricted in distribution to a small area in the south-western Cape (Fig. 43). It is common on the southern slopes of the Rivierseonderend Mountains where it is often found in ravines. The distribution area receives rain predominantly during the winter months and is frost free because of its close proximity to the coast. High temperatures are experienced during the dry summer months. Although restricted in distribution, it occurs locally in very large numbers.

P. greytonense exhibits considerable morphological variation especially of leaf characteristics, leaving the impression of a relatively young species. It is, however, already a well-established species producing large quantities of viable seed, and it is probably just a matter of time before its distribution range will be expanded.

P. greytonense is probably of hybrid origin with the sympatric *P. hermanniifolium* (Berg.) Jacq. and *P. papilionaceum* (L.) L'Hérit. as possible parent species. Many characters of *P. greytonense*, such as the shape and indumentum of the leaves, are intermediate between these two species. There is also evidence of backcrossing between *P. greytonense* and *P. hermanniifolium*. The habitat requirements of *P. greytonense* are also between those of the two putative parent species: *P. papilionaceum* growing in a rather moist, semi-shaded habitat and *P. hermanniifolium* in drier situations with direct sunlight.

It should be noted that a cytogenetic study did not readily confirm the proposed hybrid origin of *P. greytonense*. *P. hermanniifolium* is a diploid species ($2n=22$) and *P. papilionaceum* a tetraploid species ($2n=44$). One would expect *P. greytonense* to be a triploid species, but it is in fact also a diploid species ($2n=22$) with no meiotic aberrations. This could be explained by the assumption that an original diploid form of *P. papilionaceum* had been involved.

Some herbarium specimens of *P. greytonense* have been determined as *P. semitrilobum* Jacq. No type specimen of *P. semitrilobum* could be traced and the drawing in Jacq., *Hort. Schoenbr.* 2: t.130 (1797) should be considered as the iconotype of this species. The shape of the leaves, as depicted in the drawing, shows some resemblance to those of *P. greytonense*. However, the indumentum of the leaves and the shape of the posterior petals in the drawing differ completely from those of *P. greytonense*. I am of the opinion that *P. semitrilobum* is a hybrid, most probably an artificial one.

CAPE PROVINCE. — 3419 (Caledon): Caledon (–AB), Prior s.n. (PRE); Swartberg, Caledon (–AB), Zeyher 2091 (MEL; W); Steenbok River (–AD), Schlechter 9780 (Z); Greyton (–BA), Es-

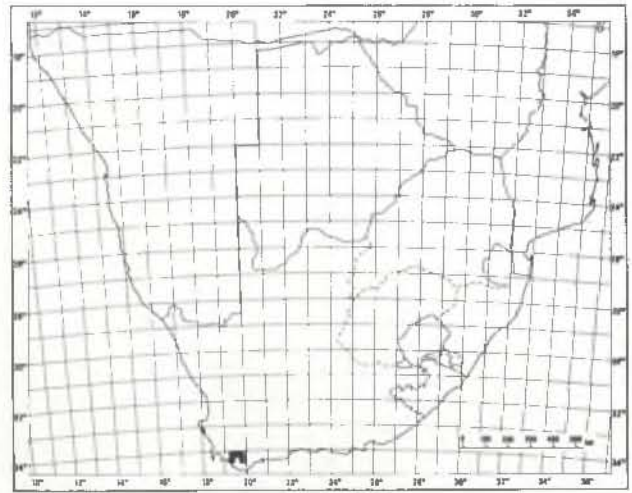


FIG. 43. — Known geographical distribution of *Pelargonium greytonense*.

terhuysen 20755 (BOL; K; PRE), Van der Walt 708, 801 (STEU), Van der Walt & Vorster 1317, 1318, 1319, (STEU); Genadendal (–BA), Van der Walt 1099 (STEU); Olifantsboskloof near Tygerhoek (–BB), Van der Walt 520 (STEU); Rivierseonderend Mountains (–BB), Ecklon & Zeyher 635 (SAM), 2090 (SAM; Z), Esterhuysen 18776 (BOL), Leighton s.n. (BOL), Stokoe s.n. (SAM); near Oubos (–BD), Van der Walt 710, 711 (STEU), 3420 (Bredasdorp); Zandfontein (–AA), Galpin 3817 (PRE).

19. *Pelargonium crispum* (Berg.) L'Hérit. in Ait., Hort. Kew. edn 1,2: 430 (1789); L'Hérit., Geran.: t. 32 (1792); Salisb., Prodr.: 316 (1796); Willd., Sp. Pl. 3: 682 (1800); Pers., Syn. Pl. 2: 233 (1806); Willd., Enum. 2: 709 (1809); Desf., Arb. 1: 464 (1809); Ait. f., Hort. Kew. edn 2,4: 180 (1812); DC., Prodr. 1: 677 (1824); Eckl. & Zeyh., Enum. 1: 81 (1835); Harv. in Fl. Cap. 1: 304 (1860); Knuth in Pflanzenr. 4,129: 469 (1912); Compton in Trans. Roy. Soc. S. Afr. 19: 294 (1931). Type: Cape Province, 'eCap. b. Spei', Grubb s.n. (SBT 138, holo.!).

Geranium crispum Berg., Deser. Pl. Cap.: 176 (1767); L., Mant.: 257 (1771); Cav., Diss. 4: 252, t. 109 (1787); Thunb., Prodr. 1: 115 (1794); Thunb., Fl. Cap. edn 2: 525 (1823).

Pelargonium crispum (Berg.) L'Hérit. var. *latifolium* L'Hérit., Geran.: t. 33 (1792) nom. nud.; ex Harv. in Fl. Cap. 1: 304 (1860). Iconotype: L'Héritier, Geran.: t. 33 (1792).

P. crispum (Berg.) L'Hérit. var. *majus* DC., Prodr. 1: 677 (1824). Iconotype: L'Héritier, Geran.: t. 32 (1792).

Erect to decumbent, much-branched, strongly lemon-scented subshrub or shrub, up to 0,75 m high and 0,5 m in diameter. Stems herbaceous when young but soon becoming woody, densely pubescent to strigose with glandular hairs interspersed, green but soon becoming brownish. Leaves strigose and densely interspersed with glandular hairs, green; lamina reniform, 3-palmatilobate to 3-palmatisect, crisped, base cordate, apices of lobes obtuse to acute, margins coarsely dentate-serrate, (2–) 5–(10) × (3–) 7–(15) mm; petiole (0,5–) 4–(15) mm long; stipules cordiform, often apiculate, 2–4 × 2–5 mm. Inflorescence: flowering branches with normal and smaller foliar leaves; peduncles 5–10 mm long, pubescent to strigose with glandular hairs interspersed; involucre bracts ovate to triangular, indumentum as on leaves, 3–4 × 1,5–2,5 mm; pseudo-umbels with 1–2 (–3) flowers each. Pedicel 2–7 mm long, sparsely

strigose and densely interspersed with glandular hairs. *Hypanthium* 5–8 mm long, indumentum as on pedicel. *Sepals* lanceolate, indumentum abaxially as on pedicel, green but sometimes with a reddish tint, ca 8 × 2–4 mm. *Petals* white to dark pink or almost purple; posterior two broadly spatulate, apices sometimes emarginate to cleft, with dark red to dark purple markings, reflexed at ca 90°, ca 18 × 10 mm; anterior three spatulate with narrow claws, slightly reflexed, ca 15 × 3 mm. 2n=22. Fig. 44.



FIG. 44. — *Pelargonium crispum*. a. flowering branch, × 1; b. leaf and stipules, × 3; c. petals, × 2; d. androecium, × 2; e. gynoecium, × 4. (From Van der Walt 612, cultivated in Stellenbosch.)

Diagnostic features

Erect to decumbent, much-branched, strongly lemon-scented subshrub or shrub. Lamina reniform, 3-palmatilobate to 3-palmatisect, crisped, strigose, base cordate. Pseudo-umbels with 1–2 (–3) flowers each. Flowers white to dark pink or almost purple, anterior petals much narrower than posterior ones, pedicel usually shorter than hypanthium.

P. crispum occurs in the south-western part of the Cape Province. It is confined to the one degree squares which include the towns of Worcester, Montagu and Bredasdorp (Fig. 45). Its distribution area falls entirely in the winter rainfall region, but is usually found on the lower slopes of mountains or on hills where the rainfall is relatively low in comparison with habitats higher up on the mountains. It often grows on sandy soil in the shelter of sandstone boulders. Temperatures are very high during the summer and frost occurs during the mid-winter months.

P. crispum flowers from August to April with a marked peak in spring (September–October).

The relationship between *P. crispum* and *P. hermannifolium* (Berg.) Jacq. is discussed under the latter species. The leaves of *P. crispum* can also be confused with those of *P. englerianum* Knuth. Differences between these two species are tabulated:

<i>P. crispum</i>	<i>P. englerianum</i>
1. Leaves lemon-scented	1. Leaves rose-camphor-scented.
2. Leaves strigose.	2. Leaves hispid.
3. Lamina crisped and relatively small.	3. Lamina less crisped and larger.
4. Young stems green.	4. Young stems purplish.
5. Flowers relatively large.	5. Flowers relatively small.

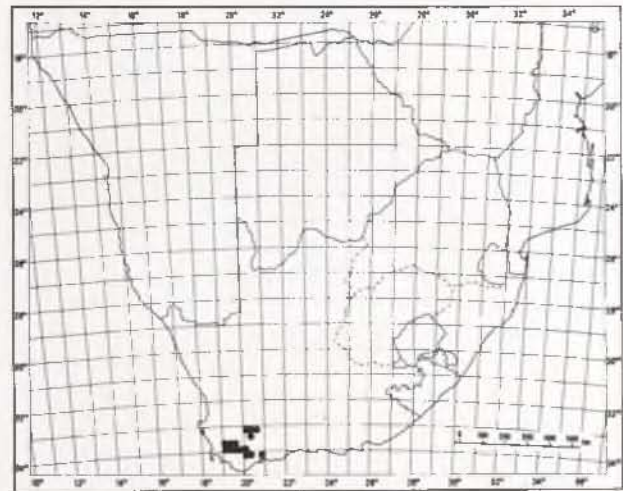


FIG. 45. — Known geographical distribution of *Pelargonium crispum*.

CAPE PROVINCE. — 3319 (Worcester): Molenaarsberg (–CA). *Esterhuysen* 14071 (BOL); Brandwacht (–CB), *Van Breda* 258 (PRE); *Walters* 164 (NBG); Veld Reserve (–CB), *Van Breda* 4 (PRE); near Worcester (–CB), *Cooper* 1704 (E; NH; PRE; Z); Brandvlei (–CB), *Rehmann* 2380 (Z); Du Toitskloof (–CC), *Compton* 20105, 22835 (NBG), *Esterhuysen* 14352, 18919a (BOL); Wemmershoek (–CC), *Barker* 275 (NBG), *Esterhuysen* 9119 (BOL), *Van der Walt* 635 (STEU); Stettynskloof (–CD), *Taylor* 5395 (SRGH; STE); between Worcester and Villiersdorp (–CD), *Bolus* 5135 (BOL; SAM); Louwshoek (–CD), *Esterhuysen* 17648 (BOL; PRE); De Doorns (–CD), *Lamb* 1574 (SAM); Kwadouw Mountains (–DA), *Esterhuysen* 10336 (BOL); Keeromsberg (–DA), *Esterhuysen* 27595 (BOL); Hexrivier (–DA), *Bolus* 13050 (BOL), *Marloth* 2701 (PRE); Naudesberg (–DA), *Barker* 9124 (NBG); Jonaskop (–DC), *Boucher* 3016 (STE), *Van der Walt* 914, 972 (STEU); Klaasvoogds (–DD), *Esterhuysen* 22691 (BOL; PRE); Robertson (–DD), *Anon* s.n. (NBG), *Compton* 5737 (BOL; PRE), *Melle* s.n. (BOL), *Nel* s.n. (STEU), 3320 (Montagu); Vooypadsberg (–AA), *Barker* 7493 (NBG); Tweedside (–AB), *Marloth* 12069b (PRE), *Van der Walt* 820 (STEU); Konstabel (–AD), *Van der Walt* 805 (STEU); Pieter Meintjies (–AD), *Rogers* 21186 (PRE; Z); Witteberg (–BA), *Adamson* s.n. (BOL), *Compton* 12229 (NBG), *Pearson* 1558 (NBG), *Van der Walt* 817 (STEU); Kogmanskloof (–CC), *Esterhuysen* 23860 (BOL; PRE), *Fredfold* 417 (PRE); SW of Kogmanskloof (–CC), *Michell* 52 (PRE); Bonnievale (–CC), *Marloth* 11830 (PRE); Keurkloof, Montagu (–CC), *Van Huyssteen* s.n. (STEU); Montagu Baths (–CC), *Compton* 18345 (NBG), *Lewis* 1770 (SAM), *Page* 126 (PRE), *Page* s.n. (BOL; Z); Montagu (–CC), *Joubert* s.n. (STEU), *Levyns* 461 (STEU), *Stephensen* s.n. (STEU), *Van Breda* 1240 (PRE), 3420 (Bredasdorp); near Stormsvlei (–AA), *Ecklon & Zeyher* s.n. (E; PRE), *Stirton* 6159 (PRE), *Zeyher* 2087

(MEL; PRE; SAM; Z); Hessequas Poort (-AA), Taylor 3966 (PRE; STE); near Swellendam (-AB), Galpin 3818 (GRA; PRE), Liebenberg 6448 (PRE; STE), Van der Walt 1291 (STEU), Wurtz 395 (NBG); Bontebok Park (-AB), Barnard 702 (PRE), Grobler 509 (PRE; STE), Jordaan s.n. (STEU), Van der Walt 612 (STEU); Heidelberg (-BB), Leipoldt s.n. (BOL).

20. *Pelargonium hermannifolium* (Berg.) Jacq., Icon. Pl. Rar. 3: t. 545 (1794); Willd., Sp. Pl. 3: 682 (1800), Pers., Syn. Pl. 2: 233 (1806); DC., Prodr. 1: 677 (1824); Spreng., Syst. Veg. 3: 58 (1826); Eckl. & Zeyh., Enum. 1: 81 (1835); Knuth in Pflanzenr. 4, 129: 464 (1912); J. J. A. van der Walt & Vorster, Pelarg. S. Afr. 2: 69, fig. (1981). Type: Cape Province, 'e Cap. b. Spei', Grubb s.n. (SBT 159, holo.!).

Geranium hermannifolium Berg., Deser. Pl. Cap.: 177 (1767); L., Mant.: 569 (1771); Cav., Diss. 4: 240 (1787); L.f., Suppl.: 305 (1781); Thunb., Prodr. 2: 115 (1800); Thunb., Fl. Cap. edn 2: 524 (1823). *Pelargonium crispum* var. *hermannifolium* (Berg.) Harv. in Fl. Cap. 1: 304 (1860).

Erect, often many-stemmed, usually non-aromatic shrub, up to 1 m high and 0.5 m in diameter. Stems herbaceous when young but soon becoming woody, densely hirsute with glandular hairs interspersed, green but becoming brownish with age. Leaves distichous, sparsely strigose to strigose with glandular hairs interspersed, green; lamina narrowly to broadly obovate, 3-palmatilobate to 3-palmatisect with the segments variably incised, often somewhat crisped, base cuneate, apex obtuse to acute, margins crenate-serrate, (5-) 10-15 (-20) × (6-) 8-12 (-20) mm; petiole (0-) 1-3 (-8) mm long; stipules cordiform, often cuspidate, ca 5 × 4 mm. Inflorescence: flowering branches with normal and smaller foliar leaves, peduncles 5-8 mm long, hirsute to strigose with glandular hairs interspersed; involucre bracts lanceolate to ovate, acuminate, indumentum as on peduncles, 4-5 × 1-2 mm; pseudo-umbels with 1-2(-3) flowers each. Pedicel ca 5 mm long. Hypanthium 6-8 mm long, indumentum as on peduncles. Sepals lanceolate, abaxially strigose, green except posterior one which is partially reddish-brown, margins white, ca 9 × 2-4 mm. Petals white to pink; posterior two broadly spatulate, apices sometimes emarginate to cleft, with dark red markings, reflexed at ca 90°, ca 19 × 13 mm; anterior three spatulate with narrow claws, reflexed at less than 90°, ca 16 × 6 mm. 2n=22. Fig. 46.

Diagnostic features

Erect, often many-stemmed shrub. Leaves distichous, strigose; lamina narrowly to broadly obovate, base cuneate, petiole relatively short. Pseudo-umbels with 1-2 (-3) flowers each. Flowers relatively large, white to pink, pedicel shorter than hypanthium.

P. hermannifolium occurs in the Cape Province from the district of Worcester southwards to Caledon and eastwards to the district of Swellendam (Fig. 47). It is associated with mountainous habitats, and is particularly common on the Riviersonderend Mountains as a component of Fynbos, where it grows in sandy soil derived from sandstone. The closely related *P. crispum* (Berg.) L'Hérit. grows in a drier habitat and the distribution of the two species on Jonaskop, Villiersdorp, is very interesting. There, *P. crispum* is found on the lower and drier



FIG. 46. — *Pelargonium hermannifolium*. a, flowering branch, × 1; b, petals, × 1; c, androecium, × 2; d, gynoecium, × 2; e, inflorescence with petals removed, × 1. (From Ward-Hilhorst 2 B, collected at McGregor.)

slopes and *P. hermannifolium* on the higher slopes where the precipitation is considerably higher.

P. hermannifolium flowers from September to April with a marked peak in spring.

The problem of distinguishing between *P. hermannifolium* and *P. crispum* goes back a long time in the history of plant taxonomy. Bergius (1767) described them as separate species, whereas L'Héritier (1789) did not recognize *P. hermannifolium*. Harvey (1860) considered it to be a variety of *P. crispum*, but Knuth (1912) again maintained them as distinct species.

The following features distinguish this species from *P. crispum*:

<i>P. hermannifolium</i>	<i>P. crispum</i>
1. Leaf base cuneate.	1. Leaf base cordate.
2. Lamina narrowly obovate to broadly obovate.	2. Lamina reniform.
3. Leaves distichous.	3. Leaves usually not distichous.
4. Leaves usually not aromatic.	4. Leaves usually strongly lemon-scented.

CAPE PROVINCE. — 3319 (Worcester); Elandsloof near Villiersdorp (-CD), Galpin 12378 (PRE), Gillett 736 (STE); between Villiersdorp and Franschhoek (-CD), Bolus 5134 (BOL; SAM); near Villiersdorp (-CD), Oliver 5487 (STE), Osrin 15 (STE); Jonaskop (-DC), Boucher 3026 (PRE; STE), Negin 2

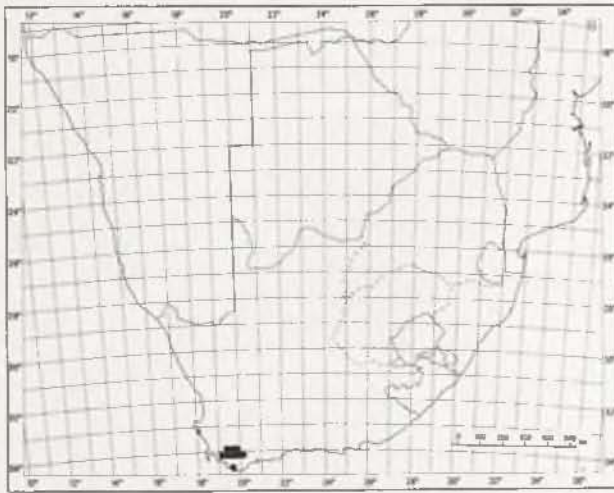


FIG. 47. — Known geographical distribution of *Pelargonium hermannifolium*.

(NBG), Rycroft 2867 (NBG), Van der Walt 915, 969 (STEU); Onkkaarberg (-DC), Marloth 85 (PRE), Stokoe 1199 (PRE); 16 km E of McGregor (-DD), Marsh 996 (PRE; STE), 3419 (Caledon); Houhoek Pass (-AA), Werdermann & Oberdieck 688 (PRE); Caledon (-AB), Bolus s.n. (BOL), Ecklon & Zeyher 636 (SAM), Elbrecht 19013 (PRE), Fischer 263 (STEU), Guthrie 2226 (NBG), Marloth 1578, 7060 (PRE), Purcell 5917 (SAM); between Caledon and Villiersdorp (-AB), Rycroft 1724 (NBG); Swartberg, Caledon (-AB), Esterhuysen 18940 (BOL; PRE), MacOwan 2950 (SAM), Schlechter 5565 (Z), Schlechter 9767 (E; MO; PRE; Z), Zeyher 2085 (SAM; Z); Boesmans Pass near McGregor (-BA), Esterhuysen 4297 (BOL; PRE), Hugo 417 (PRE; STE), Rycroft 3216 (MO); Genadendal (-BA), Bolus 7377 (BOL), Gillett 846 (STE); Greyton (-BA), Taylor 9526 (MO; SRGH), Van der Walt 803, 1094 (STEU), Van der Walt & Vorster 1316 (STEU); Riviersonderend (-BB), Esterhuysen 18773, 23794 (BOL); Riviersonderend Mountains (-BB), Stokoe s.n. (BOL; SAM), Wilman 970 (BOL); Tygerhoek (-BB), Van der Walt 796 (STEU); Boesmansrivier (-DA), Barker 1147 (NBG), 3420 (Bredasdorp); Stormsvlei (-AA), Compton 18522 (NBG).

21. *Pelargonium cordifolium* (Cav.) Curtis in Curtis's bot. Mag. 5: t. 165 (1792); Salisb., Prodr.: 314 (1796); H.E. Moore in Bailey 3: 10, fig. 4 (1955); Batten & Bokelmann, Wild. Flow. E. Cape Prov.: 86 (1966); J. J. A. v.d. Walt, Pelarg. S. Afr. 1: 9, fig. (1977). Type: Cape Province, 'Habitat ad Caput Bona Spei. V.S. apud D.D. de Jussieu et Thouin ex collectis a DD. Thunbergio et Sonnerat', (P-JU, lecto.; MA!, both specimens with Cavanilles's handwriting).

Geranium cordifolium Cav., Diss. 4: 240, t. 117, fig. 3 (1787); Thunb., Prodr. 2: 114 (1800); Andrews, Geran. 1: C, ic (1805); Thunb., Fl. Cap. edn 2: 521 (1823). *Pelargonium cordatum* L'Hérit. in Ait., Hort. Kew. edn 1.2: 427 (1789); Willd., Sp. Pl. 3: 670 (1800); Pers., Syn. Pl. 2: 231 (1806); Willd., Enum. 2: 705 (1809); Desf., Arb. 1: 461 (1809); Ait. f., Hort. Kew. edn 2.4: 173 (1812); Sweet, Geran. 1: 67 (1821); DC., Prodr. 1: 671 (1824); Spreng., Syst. Veg. 3: 58 (1826); G. Don, Gen. Syst. 1: 740 (1831); Eckl. & Zeyh., Enum. 1: 79 (1825); Harv. in Fl. Cap. 1: 302 (1860); Knuth in Pflanzenr. 4, 129: 464 (1912); Courtenay-Latimer & Smith, Flow. Pl. Tsitsikamma: t. 40 (1967).

Geranium lanatum Thunb., Prodr. 2: 114 (1800); Fl. Cap. edn 2: 518 (1823). *Pelargonium lanatum* (Thunb.) DC., Prodr. 1: 681 (1824); Eckl. & Zeyh., Enum. 1: 79 (1835). *P. cordatum* L'Hérit. var. *lanatum* (Thunb.) Harv. in Fl. Cap. 1: 302 (1860); Knuth in Pflanzenr. 4, 129: 464 (1912). Type: Cape Province, locality and collector unknown (UPS, holo.), specimen with Thunberg's handwriting).

P. rubrocinctum Link, Enum. Hort. Berol. 2: 191 (1822); DC., Prodr. 1: 671 (1824); Spreng., Syst. Veg. 3: 58 (1826); Steud.,

Nom. Bot. edn 2.2: 289 (1841); ex descr. *P. cordatum* L'Hérit. var. *rubrocinctum* (Link) Harv. in Fl. Cap. 1: 302 (1860); Knuth in Pflanzenr. 4, 129: 464 (1912). Type: Cape Province, 'Hab. in Pr. b. Sp.' (B+).

P. dregeanum Turcz. in Bull. Soc. Nat. Moscow 31: 423 (1858). Type: Cape Province, George, Drege 7450a (E!; G!; MO!; OXF!; P!; PRE!; TCD!).

Erect, branched, aromatic shrub, up to 1.75 m high and 1 m in diameter. Stems herbaceous when young but soon becoming woody, pubescent to villous and with long glandular hairs interspersed, green but becoming brownish with age. Leaves: indumentum extremely variable but always with long glandular hairs; lamina cordiform, adaxially glabrate to sparsely villous and green, abaxially pubescent to villous or tomentose with a velvety texture, often greyish, base cordate, apex usually acute, margin dentate and sometimes reddish with the teeth often reddish, (20-) 65 (-100) × (15-) 55 (-90) mm; petiole (15-) 70 (-120) mm long; stipules narrowly triangular to triangular, cuspidate, indumentum as on stems, 8-12 × 3-7 mm. Inflorescence: flowering branches profusely branched, with smaller foliar leaves; peduncles 10-50 mm long, pubescent to densely villous and with long glandular hairs interspersed; involucre bracts ovate to narrowly triangular, acuminate, pubescent and with long glandular hairs and soft hairs in between, 6-10 × 2-4 mm; pseudo-umbels with 3-12 flowers each. Pedicel 5-15 mm long, relatively thin, pubescent to densely vil-



FIG. 48. — *Pelargonium cordifolium*. a, flowering branch, × 1; b, petals, × 1; c, androecium, × 2; d, gynoecium, × 2; e, inflorescence with petals of one flower removed, × 1. (From Ward-Hilhorst 54, collected at Stormsvier.)

lous with many long glandular hairs in between. *Hypanthium* 2–12 mm long, prominently thickened at base, indumentum as on pedicel. *Sepals* lanceolate, apiculate, indumentum abaxially as on pedicel, green with a reddish-brown tint, ca 12 × 2–3 mm. *Petals* variable in shape and colour, white to pale pink to bright purple; posterior two spatulate to obovate, apices obtuse or emarginate, with dark purple feather-like markings, reflexed at more than 90°, 20–30 × 5–15 mm; anterior three lorate to narrowly lanceolate, slightly reflexed, 15–25 × 2–4 mm. 2n=22. Fig. 48.

Diagnostic features

Erect, branched and aromatic shrub. Lamina cordiform, abaxial side usually velvety and much more hairy and lighter in colour than adaxial side. Flowering branches profusely branched. Pseudo-umbels with 3–12 flowers each. Flowers white to light pink to bright purple, anterior petals much narrower than posterior ones, pedicel relatively thin and usually longer than hypanthium.

P. cordifolium occurs from Potberg near Bredasdorp in the south-western Cape, eastwards to the district of Stutterheim in the eastern Cape (Fig. 49). It is particularly common in the southern Cape where it often grows in close proximity to the coast. In the southern Cape it receives rain in winter as well as in summer, and in the eastern Cape predominantly summer rains. It is usually found on sandy, well-drained soil in semi-shaded situations near running water. Temperatures are high during the summer and frost can occur at some of the more inland localities.

P. cordifolium flowers from August to January although the odd flower may be found as early as June. There is a definite flowering peak in spring from September to October.

The cordiform leaves of *P. cordifolium* are so typical that it can hardly be confused with other species of the section *Pelargonium*. It is apparently related to *P. hispidum* (L.f.) Willd. and *P. papilionaceum* (L.) L'Hérit., which have a similar floral structure with the posterior petals much wider than the anterior ones.

The degree of hairiness of the leaves varies considerably and this led to the recognition of three varieties and even different species by previous workers. The populations in the western part of the distribution area have less hairy leaves than those in the east. There is, however, a gradual transition from almost glabrous leaves to villous leaves over the distribution area as a whole, and it is therefore not advisable to recognize infraspecific taxa.

CAPE PROVINCE. — 3226 (Fort Beaufort): Kathberg Pass (–BC), *Dyer* 759 (PRE), *Sidey* 3743 (PRE), *Story* 392 (PRE), *Van der Walt* 987 (STEU), *Werdermann* & *Oberdieck* 1066 (PRE); Kettlespoort Falls (–DB), *Hilliard* & *Burt* 10943 (MO); Hogsback (–DB), *Barker* 936 (NBG), *Bokelmann s.n.* (NBG), *Dahlstrand* 1549 (GRA), *Giffen* 308 (PRE), *Rattray* 410 (GRA), *Sidey* 3765 (PRE), *Stayner* 5 (GRA), *Stinton* 6236 (MO; PRE; SRGH); 3227 (Stutterheim): Evelyn Valley (–CB), *Compton* 19159 (NBG), *Leighton* 2683 (BOL), *Taylor* 4261 (NBG; PRE); Kologha (–CB), *Acocks* 9004 (PRE), *Flanagan* 2181 (BOL; PRE); near King William's Town (–CD), *Sim* 1326 (BOL). 3321 (Ladismith): Garcia's Pass (–CC), *Bolus* 11226 (BOL; Z), *Van der Walt*

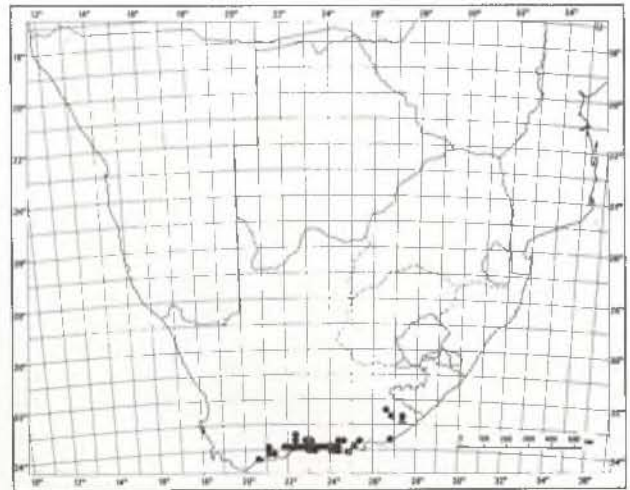


FIG. 49. — Known geographical distribution of *Pelargonium cordifolium*.

622, 831, 1298 (STEU); Cloetes Pass (–DD), *Middlemost* 2015 (NBG). 3322 (Oudtshoorn): *Spitzkop* (–AD), *Rycroft* 3108 (NBG); Langkloof (–CB), *Ecklon* & *Zeyher* 619 (S; SAM); Ruitersbos (–CC), *Hops* 1 (BOL), *Van Niekerk* 22, 129 (BOL); Robinson Pass (–CC), *Maguire* 796 (NBG), *Van der Walt* 1128 (STEU); near George (–CC), *Drège* 7450a (E; K; MO; OXF; P; PRE; TCD), *Gillett* 2070 (BOL), *Guthrie* 4284 (NBG), *Paterson* 1226 (GRA), *Schlechter* 2307 (Z), *Stephany s.n.* (Z), *Tennant* 2 (NBG); Montagu Pass (–CD), *Compton* 7574 (NBG), *Hienstra* 329 (NBG), *Hutchinson* 1198 (BOL; PRE), *Neser s.n.* (STEU), *Schonken* 194 (STEU), *Stokoe s.n.* (SAM), *Taylor* 3679 (PRE), *Thorne s.n.* (SAM), *Van Breda* 1121 (PRE), *Van der Walt* 424, 1306 (STEU); 13 km E of George (–CD), *Hutchinson* 1265 (BOL); Sandplaats (–CD), *Thorne s.n.* (SAM); Joubertsberg (–CD), *Taylor* 1672 (PRE); Mannetjiesberg (–DB), *Esterhuysen* 6487 (BOL); Kaymansgat (–DC), *Drège* 7450 (MO); Outeniqua Pass (–DC), *Compton* 24418 (NBG), *Lewis* 3911 (SAM); Saasveld (–DC), *Schonken* 184, 195 (STEU), *Van der Walt* 679 (STEU); Karatara Pass (–DD), *Marsh* 597 (PRE). 3323 (Willowmore): Krantzkop near Avontuur (–CA), *Stokoe s.n.* (SAM); 10 km S of Avontuur (–CA), *Marsh* 630 (PRE), *Thompson* 570 (PRE; STE); Prince Alfred's Pass (–CC), *Britten s.n.* (GRA), *Salter* 6741, 6797 (BOL), *Van der Walt* 720 (STEU); Gouna Reserve (–CC), *Taylor* 1316 (SAM); Paardekop near Knysna (–CC), *Steyn* 714 (BOL); near Keurboomsrivier (–CD), *Gillett* 4576 (PRE), *Marsh* 1329 (PRE), *Story* 3112 (MO; PRE), *Theron* 1778 (PRE; Z); Louterwater (–DC), *Zinn s.n.* (SAM); Helpmekaar Peak (–DC), *Esterhuysen* 4575 (BOL; PRE); Grootrivier Pass (–DC), *Schlieben* & *Ellis* 12327 (PRE); Stormsrievier Pass (–DD), *Liebenberg* 6370 (PRE). 3324 (Steytlerville): Onder Kouga (–CB), *Bayliss* 5967 (MO; NBG); Kareedouw Pass (–CC), *Gillett* 2030 (PRE); Kareedouw (–CC), *Neser s.n.* (STE), *Thode* A754 (PRE); Grootrivier (–CC), *Sidey* 1706 (PRE); 33 km from Kareedouw on Knysna road (–CD), *Story* 3646 (PRE); Bavianskloof (–DA), *Bayliss* 4303 (MO; NBG; Z). 3325 (Port Elizabeth): Springfield (–CB), *Keet s.n.* (PRE); Otterford Forest Reserve (–CC), *Dahlstrand* 793 (GRA), *Rodin* 1136 (BOL; MO; PRE), *Schonken* 127 (STEU), *Thompson* 1836 (PRE); Van Stadsrievier (–CC), *Bolus* 783 (BOL), *Ecklon* & *Zeyher* 620 (S; SAM), *Long* 640 (PRE), *Paterson* 891 (GRA), *Paterson* 2525 (PRE); Longmore Forest Reserve (–CC), *Dahlstrand* 718 (PRE); Loeric Plantation (–CC), *Dix* 42 (BOL) (Bredasdorp): Potberg (–BC), *Esterhuysen* 23243 (BOL), *Pillans* 9337 (BOL), *Wallgate* 911 (PRE). 3421 (Riversdale): Corente River (–AA), *Muir* 40 (PRE); Tysmanshoek (–AB), *Muir* 5427 (PRE). 3422 (Mossel Bay): Victoria Bay (–BA), *Compton* 15781 (NBG); Belvidere near Knysna (–BB), *Van der Walt* 841 (STEU). 3423 (Knysna): Knysna (–AA), *Wurts* 2123A (NBG); Paardekop (–AA), *Steyn* 714 (BOL); Nanutzi forest (–AA), *Hardy* 867 (PRE; SRGH); Noetzie (–AA), *Middlemost s.n.* (NBG); Kranskop West (–AA), *Horn s.n.* (PRE); Goudveld Forest Reserve (–AA), *Boucher* 40 (STEU); Concordia (–AA), *Kapp* 70 (PRE), *Phillips* 98 (GRA); Kruisfontein Mountains (–AA), *Galpin* 3821 (PRE); Portland (–AA), *Duthie* 1164 (BOL); Plettenberg Bay (–AB), *Ecklon* & *Zeyher* 618 (S; SAM), *Rogers* 26829 (PRE), *Rogers* 27881 (GRA);

PRE; SAM; Z), Rogers 27975 (Z); between Keurboomsrivier and Stormsrievier (-AB), Gillett 4576 (BOL; PRE); Tsitsikamma (-BB), Baitin s.n. (PRE), Zeyher s.n. (SAM); Stormsrievier (-BB), Hall 212 (NBG), Schonken 131 (STEU), Taylor 3714, 5927 (NBG), Tyson 985, 3014 (SAM). 3424 (Humansdorp); Witelsbos (-AA), Fourcade 1368 (BOL), Thompson 883 (PRE); Clarkson (-AB), Thode A755 (PRE); Hofmansbos (-BB), Britten 1195 (GRA; PRE); Humansdorp (-BB), Britten 1012 (PRE), Rogers 3018 (PRE).

22. *Pelargonium hispidum* (L.f.) Willd., Sp. Pl. 3: 677 (1800); Pers., Syn. Pl. 2: 232 (1806); Ait. f., Hort. Kew. edn 2,4: 177 (1812); Eckl. & Zeyh., Enum. 1: 79 (1835); DC., Prodr. 1: 679 (1824); Harv. in Fl. Cap. 1: 307 (1860); Knuth in Pflanzenr. 4,129: 474 (1912); J. J. A. v.d. Walt & Vorster, Pelarg. S. Afr. 2: 73, fig. (1981). Type: Cape Province, 'Habitat in Cap. bonae Spei', Bäck s.n. sub LINN 858:22 (LINN, holo.!).

Geranium hispidum L.f., Suppl.: 304 (1781); Murray, Syst. Veg. 14: 614 (1784); Cav., Diss. 4: 248, t. 110, fig. 1 (1787); Thunb., Prodr. 2: 115 (1800); Thunb., Fl. Cap. edn 2: 521 (1823).

Erect, branched, faintly lemon-scented shrub, up to 2,5 m high and 1 m in diameter. Stems herbaceous when young but soon becoming woody, pubescent to hirsute and with glandular hairs interspersed, green but becoming greyish with age. Leaves pubescent to hirsute and with glandular hairs interspersed, green to dull green; lamina palmatilobate to palmatisect with segments sometimes irregularly incised, conspicuously veined abaxially, base cordate, apices of lobes acute, margins irregularly sinuous to dentate, (50-) 90-120 (-250) × (60-) 100-130 (-270) mm; petiole (50-) 80 (-130) mm long; stipules lanceolate,



FIG. 50. — *Pelargonium hispidum*. a, flowering branch, × 1; b, petals, × 2; c, androecium, × 2; d, gynoecium, × 4. (From Van der Merwe s.n. (sub STEU 2743), cultivated in Stellenbosch.)

7-10 × 2-3 mm. *Inflorescence*: flowering branches profusely branched, with smaller foliar leaves, peduncles 10-40 mm long, hirsute and densely interspersed with glandular hairs; involucre bracts lanceolate, indumentum as on peduncles, 6-8 × 1-2 mm; pseudo-umbels with 6-12 flowers each. *Pedicel* 5-7 mm long; indumentum as on peduncles. *Hypanthium* 3-4 mm long, prominently thickened at the base. *Sepals* lanceolate, indumentum as on peduncles, green with reddish-brown bases and white margins, ca 8 × 2-3,5 mm. *Petals* pale to deep pink; posterior two asymmetric-obovate, with wine-red feather-like markings, reflexed at more than 90°, ca 12 × 7 mm; anterior three spatulate with long and narrow claws, with darker pigmentation towards bases, practically straight, ca 8 × 2 mm. 2n=44. Fig. 50.

Diagnostic features

Erect, branched, faintly lemon-scented shrub. Leaves relatively large, pubescent to hirsute, green to dull green, lamina palmatilobate to palmatisect. Flowering branches profusely branched, pseudo-umbels with 6-12 flowers each. Flowers pale to deep pink, two posterior petals much wider than the anterior three, pedicel longer than hypanthium.

P. hispidum occurs commonly in the mountains of the south-western Cape as well as in the Swartberg Range in the southern Cape, from Piketberg eastwards for about 450 km to Meiringspoort in the Oudtshoorn District (Fig. 51). Although consistently associated with mountains, it is confined to the lower slopes where it occurs in shady ravines, usually near streams between boulders or on scree. It has been recorded at altitudes of between 300 and 1 000 m, but there is one record of it occurring at 1 350 m from the Swartberg Pass area. It is a component of Fynbos or may even be associated with ravine forest precursors. The soil in these situations is usually sandy, often with a high percentage of organic matter. Temperatures are high during summer, and frost may occur during winter. The sheltered niches occupied by *P. hispidum* are probably less exposed to environmental extremes than the area in general. Usually growing close to streams, it probably has a constant supply of moisture available throughout the year, irrespective of rainfall.

P. hispidum flowers throughout the summer, from September to the following April, but with a marked peak in October and November.

Inflorescence and floral characters indicate a close relationship between *P. hispidum*, *P. cordifolium* (Cav.) Curtis, *P. papilionaceum* (L.) L'Hérit. and *P. tomentosum* Jacq. *P. hispidum* may be confused with *P. papilionaceum*, but in the latter species the leaves are only shallowly lobed and the flowers are larger with a conspicuous white spot on the two posterior petals.

CAPE PROVINCE. — 3218 (Clanwilliam): Piquetberg (-DB), Pillans 7187 (BOL). 3318 (Cape Town): Paarlberg (-DB), Drège s.n. (PRE), Drège 9119 (PRE); Pic Blanche near Paarl (-DB), Esterhuysen 1672 (BOL). 3319 (Worcester): Winterhoekberg (-AA), Bolus 5324 (BOL), Ecklon & Zeyher 616 (SAM); Twenty Four River Mountains (-AA), Esterhuysen 29954 (BOL), Van der Walt 1016 (STEU); farm Roodesand near Tulbagh (-AC), Cillie s.n. (STEU); Tulbagh Waterfall (-AC), Guthrie 3108 (NBG);

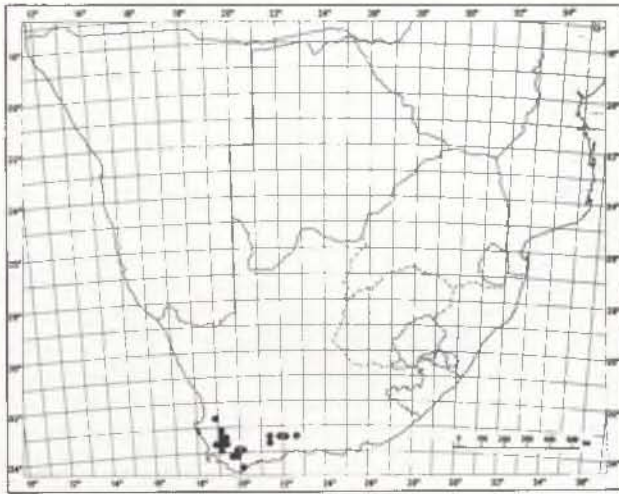


FIG. 51. — Known geographical distribution of *Pelargonium hispidum*.

Steendal near Tulbagh (-AC), MacOwan 1559 (SAM); Witzenberg (-AC), Esterhuysen 22505 (BOL), Zeyher 200 (BOL; E; PRE; SAM); Michell's Pass near Ceres (-AD), Bolus 2601 (BOL; SAM), Van der Walt 1283 (STEU); Skilderberg near Ceres (-AD), Stokoe 2653 (BOL); Du Toitskloof (-CA), Barker 4827 (NBG), Esterhuysen 22295 (BOL; PRE), Stokoe s.n. (SAM); Bainskloof (-CA), Compton 16916 (NBG), Esterhuysen 25633 (BOL), Schlechter 9196 (PRE); near Worcester (-CB), Fine 916 (PRE), Rehmann 2454 (PRE; Z); Audensberg near Worcester (-CB), Compton 9792 (NBG), Esterhuysen 22906 (BOL; PRE); Waaihoek near Worcester (-CB), Esterhuysen 22680 (BOL; PRE); Malkopskloof (-CB), Esterhuysen 3810 (BOL); Brandwacht Mountains near Worcester (-CB), Acocks 15253 (PRE); Wemmershoek (-CC), Compton 10141 (BOL), Esterhuysen 4032 (BOL; NBG); Du Toit's Peak (-CC), Esterhuysen 16640 (BOL); Haalhoek (-CC), Esterhuysen 13545 (BOL); Klein Drakenstein Mountains (-CC), Esterhuysen 20855 (BOL); Molenaarsberg (-CC), Esterhuysen 14099 (BOL; MO); Klaasvoogds (-DD), Esterhuysen 22705 (BOL; PRE), 3320 (Montagu); Montagu Baths (-CC), Page 118 (PRE), Page s.n. (BOL); Donkerkloof, Montagu (-CC), Compton 18458 (NBG), Lewis 1778 (SAM), 3321 (Ladismith); Seven Weeks Poort (-AD), Van der Walt 629 (STEU), Wurts 1218 (NBG); Waterkloof near Ladismith (-BD), Van der Walt 1121 (STEU); Bailey's Peak (-CB), Esterhuysen 22331 (BOL), 3322 (Oudtshoorn); Swartberg Pass (-AC), Stokoe 9044 (BOL), Van der Walt 726 (STEU), Wall s.n. (NBG); Meiringspoort (-BC), Esterhuysen 24879 (BOL; MO; PRE), Van der Walt 1145 (STEU), 3419 (Caledon); Genadendal (-BA), Ecklon & Zeyher 615 (SAM), Pappe s.n. (MEL), Schlechter 9848 (BOL; E; GRA; MO; PRE; Z), Van der Walt 1092 (STEU); Tygerhoek (-BB), Van der Walt 519 (STEU), 3420 (Bredasdorp); Potberg (-CA), David s.n. (NBG), Esterhuysen 23227 (BOL; PRE), Pillans 9309 (BOL; NBG), Pillans 9469 (BOL).

23. *Pelargonium papilionaceum* (L.) L'Hérit. in Ait., Hort. Kew. edn 1,2: 423 (1789); Salisb., Prodr.: 316 (1796); Willd., Sp. Pl. 3: 671 (1800); Pers., Syn. Pl. 2: 231 (1806); Willd., Enum.: 706 (1809); Ait. f., Hort. Kew. edn 2,4: 174 (1812); Sweet, Geran. 1: 27 (1820); DC., Prodr. 1: 671 (1824); Spreng., Syst. Veg. 3: 59 (1826); Eckl. & Zeyh., Enum. 1: 79 (1835); Harv. in Fl. Cap. 1: 305 (1860); Knuth in Pflanzenr. 4,129: 465 (1912); Phillips in Rep. S. Afr. Ass. Advmt. Sci.: 456 (1918); J. J. A. v.d. Walt, Pelarg. S. Afr. vol. 1: 32, fig. (1977). Lectotype: 'Habitat in Africa', LINN 858.5! (LINN).

Geranium papilionaceum L., Sp. Pl. edn 1,2: 676 (1753); L., Sp. Pl. edn 2,2: 945 (1763); Burm. f., Prodr. Fl. Cap.: 18 (1768); Mill., Gard. Dict. edn 8: 27 (1768); Murray, Syst. Veg.: 613

(1784); Cav., Diss. 4: 244, t. 112, fig. 1 (1787); Thunb., Prodr. 2: 114 (1800); Thunb., Fl. Cap. edn 2: 521 (1823).

Erect, much-branched, strongly aromatic shrub with an unpleasant odour, up to 2,5 m high and 1,5 m in diameter. Stems herbaceous when young but soon becoming woody, villous and with glandular hairs interspersed, green but becoming greyish-brown with age. Leaves sparsely villous and densely interspersed with glandular hairs, green; lamina cordiform in outline, shallowly 3- (5-8)-lobed, conspicuously veined, base cordate, apices of lobes usually obtuse but sometimes acute, margin crenate-dentate, (25-) 85 (-190) × (25-) 100 (-250) mm; petiole (10-) 50-70 (-250) mm long; stipules cordiform to triangular, 4-10 × 3-12 mm. Inflorescence: flowering branches profusely branched, with smaller foliar leaves, peduncles 20-100 mm long, villous and with glandular hairs interspersed; involucre bracts ovate, apiculate, indumentum as on peduncles, 5-8 × 4-6 mm; pseudo-umbels with 4-20 flowers each. Pedicel 7-15 mm long, relatively thin, sparsely villous and densely interspersed with glandular hairs. Hypanthium 2-5 mm long, prominently thickened at the base. Sepals lanceolate, apiculate, indumentum abaxially as on pedicel, green with a reddish-brown tint, ca 8 × 3-4 mm. Petals pale pink to carmine; posterior two spatulate to obovate, apices obtuse to emarginate, with a dark red-purplish and white blotch, reflexed at more than 90°, ca 20 × 7 mm; anterior three narrowly spatulate with short claws, reflexed at less than 90°, ca 7 × 2 mm. 2n=44. Fig. 52.

Diagnostic features

Erect, much-branched shrub with an unpleasant odour. Lamina cordiform in outline, shallowly 3-8-lobed, conspicuously veined, sparsely villous. Flowering branches profusely branched. Pseudo-umbels with 4-20 flowers each. Flowers pale pink to carmine, anterior three petals much shorter and narrower than posterior two, pedicel relatively thin and longer than hypanthium.

P. papilionaceum occurs in a relatively narrow strip along the coast from Somerset West in the south-western Cape, eastwards to Humansdorp in the eastern Cape (Fig. 53). This area receives rain chiefly during the winter months. The species is consistently associated with mountains and is usually found on the margins of ravine forests near streams where it grows in sandy soil with organic matter. Temperatures are high during the dry summer months, but a mild microclimate is created in the moist and semi-shaded habitats. The winters are frost-free due to close proximity to the coast.

P. papilionaceum flowers from August to January with a peak in September-October. Except for the mid-winter months, the odd flower can be found throughout the year.

P. papilionaceum could be confused with *P. tomentosum* (L.) L'Hérit. and *P. hispidum* (L.f.) Willd. The morphological differences between *P. papilionaceum* and these two species, are discussed under *P. tomentosum* and *P. hispidum* respectively. The leaves of *P. papilionaceum* resemble those of *P. vitifolium* (L.) L'Hérit. to a certain extent. These



FIG. 52. — *Pelargonium papilionaceum*. a, flowering branch, $\times 1$; b, petals, $\times 1.5$; c, androecium, $\times 2$; d, gynoecium, $\times 2$. (From Ward-Hilhorst 87, collected at Helderberg Nature Reserve.)

two species could, however, easily be distinguished by inflorescence and floral characteristics. *P. vitifolium* has a capitulum-like inflorescence and the flowers are less zygomorphic than those of *P. papilionaceum*.

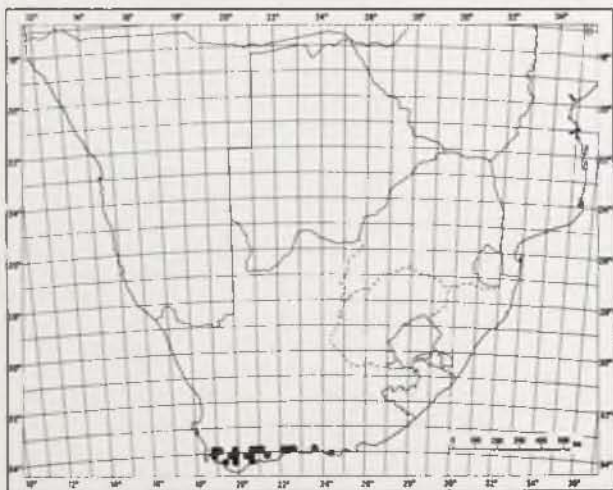


FIG. 53. — Known geographical distribution of *Pelargonium papilionaceum*.

CAPE PROVINCE. — 3318 (Cape Town): Jonkershoek, Guardian Peak (-DD), Esterhuysen 11949, 24127 (BOL); Jonkershoek, Swartboskloof (-DD), Van der Merwe 23-59 (PRE); Jonkershoek, Langrivier (-DD), Van der Walt 507, 639 (STEU); Stellenbosch (-DD), Guthrie 2327 (NBG). 3319 (Worcester): French Hoek Pass (-CC), Esterhuysen 24375 (BOL); French Hoek (-CC), Marloth 5307 (PRE), Phillips 1054 (SAM);

Klaasvoogds (-DD), Esterhuysen 22704 (BOL), 3320 (Montagu); Tradouw Pass (-DC), Esterhuysen 24610 (BOL; MO; PRE), Van der Walt 827, 1292 (STEU); Grootvadersbos, Swellendam (-DD), Esterhuysen 19261, 25031 (BOL), Marloth 3512 (PRE), Zeyher 2093 (PRE; SAM); Ten O'Clock Mountain, Swellendam (-DD), Wurts 354 (NBG); Voormansbos, Swellendam (-DD), Zeyher s.n. (SAM); near Duiwelsbos (-DD), Van der Walt 1289 (STEU); Langeberge near Swellendam (-DD), Schlechter 5710 (BOL; Z); Hermitage Kloof near Swellendam (-DD), Esterhuysen 24625 (BOL; PRE), 3321 (Ladismith); Garcia's Pass (-CC), Galpin 3816 (PRE), Marloth 12583 (PRE), Moffett 1074 (STEU), Muir 2919 (PRE), Thorne s.n. (SAM), Van der Walt 619 (STEU), 3322 (Oudtshoorn); Robinson Pass (-CC), Salter 6343 (BOL), Van der Walt 1126 (STEU); 10 km E of George (-CD), Schonken 186 (STEU); Saasveld (-DC), Van der Walt 719 (STEU), 3323 (Willowmore); N slopes of Tsitsikamma Mountains near Joubertina (-DC), Esterhuysen 22792 (BOL), 3418 (Simonstown); Helderberg (-BB), Dummer 564 (E), Stokoe s.n. (BOL), Van der Walt 496 (STEU), Van der Walt & Vorster 1320 (STEU); Diepgat near Somerset West (-BB), Esterhuysen 8233 (BOL), 3419 (Caledon); Kleinrivier near Caledon (-AD), Ecklon & Zeyher 617 (SAM); Vogelgat Kloof near Caledon (-AD), Williams 2606 (MO); Greyton (-BA), Van der Walt 707, 800, 1315 (STEU); Riviersonderend Mountains (-BB), Esterhuysen 25089 (BOL; MO; PRE); Oubos (-BD), Van der Walt 713 (STEU), 3420 (Bredasdorp); near Swellendam (-AB), Ecklon 613 (PRE; S); Buffels-jagrivier (-BA), Drège s.n. (S); Zuurbrak (-BA), Schlechter 5710 (Z); Potberg (-BC), Pillans 9309 (PRE), 3421 (Riversdale); Riversdale (-AB), Muir 2919 (BOL), 3424 (Humansdorp); Clarkson (-AB), Thode A757 (PRE).

24. *Pelargonium tomentosum* Jacq., Icon. Pl. Rar. 3: 10, t. 537 (1794); Willd., Sp. Pl. 3: 677 (1800); Curtis in Curtis's bot. Mag. 15: t. 518 (1801); Pers., Syn. Pl. 2: 232 (1806); Ait. f., Hort. Kew. edn 2,4: 177 (1812); Sweet, Geran. 2: 168 (1823); DC., Prodr. 1: 671 (1824); Spreng., Syst. Veg. 3: 61 (1826); Harv. in Fl. Cap. 1: 305 (1860); Knuth in Pflanzenz. 4,129: 458 (1912); J. J. A. v.d. Walt & Vorster, Pelarg. S. Afr. 2: 145, fig. (1981). Type: Locality and collector unknown (W, holo.), specimen with Jacquin's handwriting).

Geranium tomentosum (Jacq.) Poir., Encycl. Suppl. 2: 754 (1811). *Geranospermum tomentosum* (Jacq.) Kuntze, Rev. Gen. 1: 95 (1891).

Pelargonium micranthum Eckl. & Zeyh., Enum. 1: 79 (1835). Type: Cape Province, 'In montium lateralibus prope Swellendam', Ecklon & Zeyher 614 (S!; SAM!).

P. corymbosum Turcz. in Bull. Soc. Nat. Moscow 31,1: 422 (1858). Type: Cape Province, 'C.b. spei', Zeyher 2095 (MEL!; PRE!; SAM!; Z!).

Decumbent, much-branched, peppermint-scented subshrub, up to 0,5 m high and 1,5 m in diameter. Stems herbaceous and brittle, becoming somewhat woody with age, villous and densely interspersed with glandular hairs, greyish-green but becoming brownish with age. Leaves with soft hairs and numerous glandular hairs interspersed, greyish-green; lamina 3-(5)-palmatilobate to 3-(5)-palmatipartite, base cordate, apices of lobes mostly obtuse (rarely acute), margins irregularly crenate-serrate, adaxially villous, abaxially tomentose, (25-) 40-60 (-110) \times (35-) 50-70 (-120) mm; petiole (30-) 80-130 (-180) mm long; stipules triangular to ovate, acute to acuminate, 6-20 \times 4-12 mm. Inflorescence: flowering branches profusely branched, with or without smaller foliar leaves; peduncles 30-150 mm long, villous and densely interspersed with glandular hairs; involucre bracts narrowly ovate to lanceolate, acuminate, indumentum as on peduncles, 4-5 \times 1-2 mm; pseudo-umbels with 4-15 flowers each. Pedicel

18–20 mm long, indumentum as on peduncles. *Hypanthium* ca 2 mm long. *Sepals* elliptic to lanceolate, indumentum abaxially as on peduncles, green with white margins, ca $6 \times 2-3,5$ mm. *Petals* white with purple markings; posterior two elliptic to obovate with eared bases, reflexed at ca 90° , ca 9×5 mm; anterior three linear-spathulate with very narrow claws, practically straight, ca $11 \times 1,5$ mm. $2n=44$. Fig. 54.



FIG. 54. — *Pelargonium tomentosum*. a, flowering branch, $\times 1$; b, petals, $\times 2$; c, androecium, $\times 4$; d, gynoecium, $\times 4$. (From Van der Walt 1349, cultivated in Stellenbosch.)

Diagnostic features

Decumbent, much-branched, peppermint-scented subshrub. Lamina 3–(5)-palmatilobate to 3–(5)-palmatipartite, adaxially villous, abaxially tomentose. Flowering branches profusely branched. Pseudo-umbels with 4–15 flowers each. Flowers white, posterior petals auriculate, anterior petals longer and much narrower than posterior ones, pedicel much longer than hypanthium.

So far *P. tomentosum* has been collected on the Hottentots Holland Mountains near Somerset West, on the Riviersonderend Mountains near Greyton, and on the Langeberg range from Swellendam to Riversdale (Fig. 55). It is rare on the Hottentots Holland Mountains but abundant on the Langeberg range, especially near Swellendam. There is also a specimen in the herbarium of the University of Zürich (Z) which was collected by Bolus in April 1884 at Wynberg (Cape Peninsula), but the species is probably now extinct in this urbanized area.

P. tomentosum is confined to mountains where it occurs in semi-shaded, moist habitats. It is usually

found on the margins of ravine forests near streams, where it grows in sandy soil derived from sandstone.

The flowering time extends from October to January.

The species may be confused with *P. papilionaceum* (L.) L'Hérit. when they are not in flower. The main differences between these two related species are tabulated below:

<i>P. tomentosum</i>	<i>P. papilionaceum</i>
1. Leaves villous and tomentose.	1. Leaves sparsely villous.
2. Leaves peppermint-scented.	2. Leaves with an unpleasant odour.
3. Flowers white.	3. Flowers light pink to carmine.
4. Posterior petals shorter than anterior petals.	4. Posterior petals longer than anterior petals.

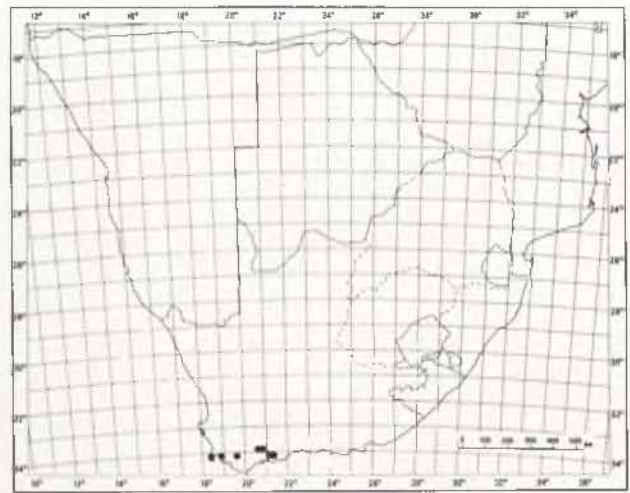


FIG. 55. — Known geographical distribution of *Pelargonium tomentosum*.

CAPE PROVINCE. — 3320 (Montagu): Tradouw Pass (–DC), Hafström & Acocks 1982 (BOL; PRE), Van der Walt 1293 (STEU); above Grootvadersbosch near Swellendam (–DD), Esterhuysen 18275 (BOL; PRE), Esterhuysen 25029 (BOL; MO; NBG); Voormansbosch near Swellendam (–DD), Ecklon & Zeyher 613 (K; MEL; OXF; W), Zeyher 2095 (MEL; PRE; SAM; Z); Ten O'Clock Mountain near Swellendam (–DD) Wurts 447, 510 (NBG); Strawberry Hill near Swellendam (–DD), Stokoe s.n. (NBG); mountains near Swellendam (–DD), Ecklon & Zeyher 614 (S; SAM). 3418 (Simonstown): Wynberg (–AB), Bolus s.n. (Z); Helderberg Nature Reserve (–BB), Van der Walt 1349 (STEU); Helderberg ravine (–BB), Esterhuysen 7656 (BOL; PRE); Vallei-berg, Hottentotsholland (–BB), Esterhuysen 29865 (BOL). 3419 (Caledon): near Genadendal (–BA), Ecklon & Zeyher 615 (P). 3421 (Riversdale): Corente River (–AA), Muir 5062 (PRE); Riversdale (–AB), Peers s.n. (BOL); De Hoek near Riversdale (–AB), Muir 2964 (PRE).

NATURAL HYBRIDS

The following natural hybrids of the section *Pelargonium* have been identified:

1 Hybrids between members of the section *Pelargonium*

Putative parent species:

- 1.1 *P. citronellum* \times *P. hispidum*
3321 (Ladismith): near Waterkloof, Ladismith (–AD), Van der Walt 1124 (STEU).

- 1.2 *P. cucullatum* subsp. *cucullatum* × *P. betulinum*
3418 (Simonstown): near Betty's Bay (-BD), Volschenk 24 (STEU).
- 1.3 *P. cucullatum* subsp. *tabulare* × *P. betulinum*
3418 (Simonstown): Klein Leeukoppie (-AB), Volschenk 17 (STEU).
- 1.4 *P. panduriforme* × *P. quercifolium*
3322 (Oudtshoorn): Duiwerivier, Baviaans-kloof (-DC), Taylor 412 (BOL).
- 1.5 *P. scabrum* × *P. glutinosum*
3322 (Oudtshoorn): Meiringspoort (-BC), Van der Walt 1445 (STEU).
- 1.6 *P. scabrum* × *P. hispidum*
3219 (Wuppertal): near Keerom (-CC), Pillans 8730 (BOL).
- 1.7 *P. scabrum* × *P. scabroide*
3319 (Worcester): Groot Winterhoek (-AA), Van der Walt 1075 (STEU).
- 1.8 *P. scabrum* × *P. sublignosum*
3218 (Clanwilliam): Farm Grootfontein near Porterville (-CC), Van der Walt 910 (STEU).
- 2 Hybrids between members of the section *Pelargonium* and the section *Eumorpha* (Eckl. & Zeyh.) Harv.

Putative parent species:

- 2.1 *P. cucullatum* subsp. *strigifolium* × *P. patulum* Jacq.
3418 (Simonstown): Swartboskloof, Jonkershoek (-BB), Van der Walt 1013 (STEU).
- 2.2 *P. cucullatum* subsp. *tabulare* × *P. patulum* = *P. dodii* Schl. ex Knuth
3418 (Simonstown): Orange Kloof (-AB), Wolley Dod 2160. (K, isotype).
- 2.3 *P. scabrum* × *P. patulum*
3418 (Simonstown): Stellenboschberg (-BB), Van der Walt 1326 (STEU).
- 2.4 *P. scabrum* × *P. grandiflorum* (Andr.) Willd.
3118 (Vanhynsdorp): Gifberg (-DC), Esterhuysen 21960 (BOL).
- 2.5 *P. sublignosum* × *P. grandiflorum*
3218 (Clanwilliam): Farm Berghof near Porterville (-CC) Van der Walt 1089 (STEU).
- 2.6 *P. sublignosum* × *P. patulum*
3219 (Wuppertal): Hexberg (-CA), Esterhuysen 18430 (PRE).
- 2.7 *P. tomentosum* × *P. patulum*
3418 (Simonstown): Helderberg Nature Reserve (-BB), Van der Walt 1350 (STEU).
- 3 Hybrids between members of the section *Pelargonium* and the section *Glaucophyllum* Harv.

Putative parent species:

- 3.1 *P. cordifolium* × *P. ternatum* (L.f.) Jacq. = *P. riversdalense* Knuth
3321 (Ladismith): Garcia's Pass (-CC), Bolus 11233 (BOL, holotype).

- 3.2 *P. scabrum* × *P. fruticosum* (Cav.) Willd.
3322 (Oudtshoorn): Meiringspoort (-BC), Van der Walt 704 (STEU).
- 3.3 *P. scabrum* × *P. lanceolatum* (Cav.) Kern. = *P. tricuspidatum* L'Hérit.
3319 (Worcester): Sandhills (-DA), Van der Walt 632 (STEU).

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UITTREKSEL

Vier-en-twintig spesies van die seksie *Pelargonium*, wat laas in 1912 deur Knuth hersien is, word in hierdie taksonomiese studie onderskei. Meeste spesies kom in suidwes-, suid- en oos-Kaap voor, waar hulle meesal in halfskadu in betreklike vogtige habitate groei. 'n Sleutel vir die identifikasie van die spesies is opgestel, en vir elke spesie is daar minstens een illustrasie asook 'n verspreidingskaart. Die seksie word as die primitiefste in die genus beskou met 'n basiese chromosoomgetal van $x = 11$.

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