A new species of *Pelargonium* with notes on its ecology and pollination biology

J.J.A. van der Walt*, D.J. McDonald† and N. van Wyk

Department of Botany, University of Stellenbosch, Stellenbosch, 7600 Republic of South Africa and ¹Botanical Research Unit, Stellenbosch, 7600 Republic of South Africa

Accepted 7 May 1990

A new species of *Pelargonium* L'Hér. (Geraniaceae) of the section *Campyli*a (Sweet) DC. is described. A plate of illustrations and a distribution map are provided for the species and the ecology and pollination of the species are also briefly discussed. *Pelargonium ocellatum* J.J.A. v.d. Walt is closely related to *P. capillare* (Cav.) Willd. and *P. tricolor* Curt. and is characterized by dark warty areas on the posterior petals. A key to distinguish the three species is provided.

*n* Nuwe spesie van *Pelargonium* L'Hér. (Geraniaceae) van die seksie *Campylia* (Sweet) DC. word beskryf. Illustrasies en 'n verspreidingskaart van die spesie word voorsien en die ekologie en bestuiwing van die spesie word ook kortliks bespreek. *Pelargonium ocellatum* J.J.A. v.d. Walt is navewant aan *P. capillare* (Cav.) Willd. en *P. tricolor* Curt. en dit word gekenmerk deur donker vratagtige kolle op die agterste kroonblare. *n* Sleutel om tussen die drie spesies te onderskei, word voorsien.

**Keywords:** Geraniaceae, new species, *Pelargonium*, pollination

*To whom correspondence should be addressed*

**Introduction**

The ovate to cordiform, incised leaf blades of the species described here, suggested that it was a member of the *Pelargonium patulum* Jacq. complex. The flowers, however, resemble those of section *Campyli*a (Sweet) DC. Further investigation of the leaf anatomy and karyology confirmed that the species is a member of the section *Campyli*a. The specific epithet *ocellatum*, chosen for the new species, refers to the dark warty areas on the posterior petals.

**Pelargonium ocellatum**

*Pelargonium ocellatum* J.J.A. van der Walt, sp. nov.

*P. capillare* (Cav.) Willd. et *P. tricolor* Curt. structura florali praeceps punctis verrucosis fuscatis in petalis posterioribus similis, sed ab eis foliis trilobatis ad trifoliolatis differt.

TYPUS.— Cape Province, farm Retreat, 31 km SW of Robertson, *Van der Walt 1569* (PRE, holotypus; STEU, isotypus).

Erect to procumbent subshrub, branched from the base, up to 0.3 m high. Stems covered with remnants of petioles, glabrous, purplish-green but turning brownish with age. *Leaves* crowded; lamina trilobate to trifoliolate, strigose with hairs distally directed, ovate to cordiform, base obtuse to cordate, 10–30 × 10–25 mm; segments/pinnae usually almost linear and irregularly incised, terminal one often pinnately incised, apices acute, margins often reddish, entire; petiole adaxially grooved and hirtellous, much longer than lamina, 15–100 mm long; stipules free, linear-triangular, hirtellous, 4–6 × ca. 1 mm. *Inflorescence:* Flowering branch with smaller foliar leaves, branched, bearing several reduced 1–3-flowered pseudo-umbels; peduncle 10–25 mm long, glabrous. *Pedicel* 3–10 mm long, hirtellous. *Hypanthium* 2–8 mm long, hirtellous. *Sepals* 5, narrowly ovate to elliptic, acuminate, abaxially pilose, reddish-green, *ca.* 6 × 1.5 mm. *Petals* 5, white to pink; posterior two ovate with darker-coloured claws, and a dark red warty area at base of each, 7–10 × 4–5 mm; anterior three narrowly ovate with short darker-coloured claws, 8–10 × 2–3 mm. *Stamens* 10, 5 fertile (4 long, 1 short), 5 staminodes of different lengths, staminal column 1–2 mm long, pollen yellow. *Ovary* ovate, 5-lobed, pilose; style dark red; stigmas 5, dark red. *Mericarps:* bases 5–6 mm long; tails 20–25 mm long. (Figure 1).

**Chromosome number**

Root tips obtained from stem cuttings collected at the type locality of *P. ocellatum* were treated using the squash technique described by Albers & van der Walt (1984). The somatic chromosome number of *P. ocellatum* has been determined as 2n = 20. The basic chromosome number is most probably x = 10.

**Leaf anatomy**

At least five leaves of plants from the type locality were studied anatomically. Transverse sections of wax-embedded petioles and laminae were cut with a rotary microtome and stained with a mixture of Safranin 0 and Alcian green (Joel 1983). Sections were taken through the middle part of the petioles and laminae.

*Petiole* more or less cordiform in transection. *Epidermis* uniseriate, cells isodiametric or slightly oblong, relatively large; trichomes unicellular or multicellular non-glandular hairs and short glandular hairs with multicellular stalks and unicellular spherical heads; stomata sometimes raised. *Cortex:* hypodermis uniseriate collenchymatous, parenchyma chlorenchymatous.
Extraxylary sclerenchyma: continuous cylinder consisting of 2–5 layers of fibres. Vascular bundles collateral, 4 main peripheral ring bundles but no smaller bundles in between, medullary bundle lacking.

*Lamina* more of less flat in transection. *Epidermis* uniseriate, anticlinal walls straight to slightly sinuous in surface view; stomata anomocytic, sometimes raised; leaves amphistomatic with more or less the same number of stomata adaxially and abaxially. *Mesophyll*: leaves isobilateral with 2–3 palisade layers adaxially and

**Figure 1** *Pelargonium ocellatum*: A, flowering branches × 1; B, trifoliolate leaf × 2; C, tripartite leaf × 2; D, sepals × 2; E, petals × 2; F, androecium × 5; gynoecium × 5. [Van der Walt 1569 (STEU)].
abaxially, and 1–2 spongy layers in between. Midvein with one vascular bundle.

Specimens studied
—3319 (Worcester): Farm Retreat, 31 km SW of Robertson (−DC), Van der Walt 1569 (PRE, STEU), McDonald 1832 (STE); Jonaskop near Villiersdorp (−DC), Van der Walt 1585 (PRE, STEU), Van Wyk 6 (PRE, STEU).

Ecology and pollination

Ecology

_Pelargonium ocellatum_ grows in shallow, well-drained, sandy soil on the rocky north-facing slopes of the Riviersonderend Mountains above the Poesjenels River valley (Figure 2). It has been found at altitudes ranging from 350–600 m. The habitat is semi-arid, with an estimated average annual rainfall of 500 mm (Dent et al. 1987). The sandy soil is yellow-brown, derived from parent rock of the Nardouw Sub-group of the Table Mountain Group (Lambrechts 1979; SACS 1980).

Plants of _P. ocellatum_ occur singly or in groups scattered on exposed rocky slopes amongst small boulders and occasionally around the bases of taller shrubs. The first population of this species encountered at the type locality in November 1988 was in an area which had been burned in March 1986. Regeneration of the fynbos in the area is relatively slow due to the aridity of the climate but plants of _P. ocellatum_ were numerous. From this we concluded that _P. ocellatum_, like its close relatives, _P. tricolor_ and _P. capillare_, responds rapidly to fire. _P. ocellatum_ is most conspicuous in the early post-fire stage. The low-growing plants then become gradually less conspicuous as the taller shrub layer closes and the plants senesce. Examination of plants in the field indicates that _P. ocellatum_ does not regenerate from a rootstock after fire.

Pollination

Speculation as to the function of the dark warty areas on the posterior petals of the zygomorphic flowers of _P. tricolor_ and _P. capillare_ led Hugo (1978) to investigate the anatomy and chemistry of the cells of these areas. It was initially suggested that these areas were extrafloral nectaries, but this has been discounted by chemical and anatomical analysis of the tissues (Hugo 1978; D.U. Bellstedt pers. comm.). Cursory examination suggests that the warty areas of _P. ocellatum_ are similar to those of the above-mentioned species.

The current view is that the dark warty areas represent areas of intense concentration of anthocyanidins in more specialized cells. These intensely shiny areas, such as those in _Papaver_ sp. (see Harborne 1982), are thought to act as targets for potential insect pollinators.

The following observations are based on a single visit to the type locality. The population was observed from 08:15 to 11:00. A species of horsefly (Diptera: Tabanidae) and a species of bee-fly (Diptera: Bombyliidae) were observed foraging for nectar on the flowers of _P. ocellatum_. These species, _Litourhina_ sp. (Bombyliidae) [proboscis length 6.50 mm (n = 1)] and _Philolichia_ (Omnatiosteres) _angulata_ Fabricius 1805 (Tabanidae: Tribe Philolichini) [proboscis length 4.87 mm (n = 4)], alighted on the flowers and probed the hypanthia for nectar. A second species of tabanid, _Philolichia_ (Philolichia) _gulosa_ Wiedemann 1828 (Tribe Philolichini), was captured in the vicinity of _P. ocellatum_ plants, but was not observed feeding on them. However, _Philolichia gulosa_ could well be involved in pollinating _P. ocellatum_ since it has a long proboscis [19.66 mm (n = 3)] adapted to flower feeding (McDonald pers. obs. on _Pelargonium denticulatum_ and E.G.H. Oliver pers. comm. observed _P. gulosa_ feeding on flowers of _Erica junonia_ (see also Bowden 1978).

One specimen of a fourth species of fly, _Megapalpus capensis_ Wiedemann (Diptera: Bombyliidae), was captured on a flower of _P. ocellatum_, but was not observed feeding. Bees may also pollinate _P. ocellatum_ in a generalist fashion.

Pollination of _P. ocellatum_ fits well within the syndrome ‘rhinomyiophily’ pollination by long-proboscid flies (Rebelo et al. 1985; Whitehead et al. 1987).

Discussion

Using floral characteristics, Marais (1981) deduced a close phenetic and phylogenetic relationship between the species of section _Campyliia_: _P. capillare_ (Cav.) Willd. (van der Walt & Vorster 1981) and _P. tricolor_ Curt. (van der Walt 1977 as _P. violareum_ Jacq.). They were placed in a group distinctly separate from the remaining species in the section on account of the occurrence of warty areas on the posterior petals. The flower of _P. ocellatum_ exhibits the same warty areas on its posterior petals.

The basic chromosome number of section _Campyliia_ has been determined as _x_ = 10 (van der Walt & van Zyl 1988). The somatic chromosome number of _P. ocellatum_ (2_2_ = 20) supports its position in section _Campyliia_ and its close relationship to _P. capillare_ and _P. tricolor_ (both 2_2_ = 20 and a basic chromosome number of _x_ = 10).

The leaf anatomy of _P. capillare_, _P. ocellatum_ and _P. tricolor_ also shows many similarities. In all three species there are four main vascular bundles without smaller
bundles in between. Medullary bundles are also lacking. The laminae of all three species are isobilateral and amphistomatic and the same trichome types are present. The species may be distinguished by the following key:

Fertile stamens 7 ............................................. \textbf{P. capillare}
Fertile stamens 5
Lamina pinnately incised, hairs on lamina proximally directed ............................................. \textbf{P. tricolor}
Lamina trilobate to trifoliolate, hairs on lamina distally directed ............................................. \textbf{P. ocellatum}

Acknowledgements
We are indebted to the following institutions and persons: the Foundation for Research Development of the Council for Scientific and Industrial Research and the Research Fund of the University of Stellenbosch for financial support; the Cape Department of Nature and Environmental Conservation for permission to collect material in the Riviersonderend Mountain Catchment Area; Miss L. Dreyer for the chromosome counts; Mr E.G.H. Oliver for translating the diagnosis into Latin; Ellaphie Ward-Hilhorst for executing the water colour painting which accompanies this paper and Dr J. LONDGT, Natal Museum, Pietermaritzburg, for identifying the entomological specimens.

References


