

CRASSULACEAE

ADROMISCHUS SCHULDtianus SUBSP. *BRANDBERGENSIS*, A NEW SUBSPECIES AND A CHECKLIST OF THE SUCCULENT FLORA OF THE BRANDBERG, NAMIBIA

INTRODUCTION

Adromischus schuldianus (Poelln.) Poelln. subsp. *brandbergensis* B.Nord. & Van Jaarsv., a new subspecies endemic to the Brandberg, northwestern Namibia, is described. Since its discovery by H.J. Wiss below Aigub Peak (Nordenstam 1974), by the second author on Königstein and Orabeskop, and later by P.V. Bruyns (Craven & Craven 2000), this taxon, due to its distinct leaf characters and isolated distribution, demanded some form of taxonomic recognition. The new subspecies is at once distinguished from *A. schuldianus* (Poelln.) Poelln. subsp. *schuldianus* by its subfusiform-ellipsoid and semiterete leaves without a clear margin; they are usually shallowly concave above, becoming channelled during the dry season. Both *A. schuldianus* subsp. *schuldianus* and subsp. *juttæ* have dorsiventrally flattened, oblanceolate (rarely obovate) leaves.

Adromischus schuldianus* (Poelln.) Poelln.** subsp. ***brandbergensis B.Nord. & Van Jaarsv., subsp. nov., differt a *A. schuldiano* (Poelln.) Poelln. subsp. *schuldianus* foliis subfusiformibus-ellipsoideis plusminusve semiteretibus 20–90 mm longis 10–15 mm crassis supra applanatis vel leviter concavis sine margine distincto apice acutis-obtusis saepe recurvatis.

TYPE.—Namibia, 2114 (Uis): Orabeskop, 2 300 m. Brandberg Mountain, (–AA), 06-04-1964, Nordenstam 3677 (ex hort. Bot. Garden, Lund, specimen in WIND, holo.!, M!, S!, iso.).

Dwarf mat-forming, branched succulent up to 70 mm high, filling crevices in granite rock fissures. *Roots* fibrous. *Branches* short and succulent, in cultivation up to 70 × 10 mm. *Leaves* alternate, spreading, subfusiform-ellipsoid to ± semiterete, 20–70 × 10–15 mm, without a

distinct margin, flattened to shallowly concave above, tapering to base and acute-obtuse and often somewhat recurved at tip, dark green and marbled with white or dull red areas. *Inflorescence* a ± one-sided raceme with 2–15 almost patent flowers; peduncle 150–500 mm long (in cultivation), 1.2–1.5 mm thick, simple or branching above middle, terete, glabrous, greenish brown or reddish; bracts 1.5 mm long, acute, succulent; bracteoles 2, basal, subulate, ± 1 mm long, acute; pedicels 5–17 mm long, somewhat thickened towards apex. *Calyx*: lobes narrowly triangular, 1.8–2.0 × 0.6–1.0 mm, acute. *Corolla* 12–15 mm long, pinkish white or wax-coloured; tube cylindrical, 2.5–3.0 mm wide; lobes patent, deltoid, acute, with somewhat wavy margins; throat bright purple inside. *Styles* subulate-filiform, 5–8 mm long, white at apex, pale green at base. *Squamæ* oblong, bifid, 1 × 0.8 mm, white. *Stamens*: filaments white or pinkish, five longer ones adnate for 5 mm, ± 12 mm long, five shorter ones adnate for 3 mm, ± 10 mm long; anthers oblong, 0.4 mm long. Figure 6.

Adromischus schuldianus subsp. *brandbergensis* appears to be endemic to the Brandberg Mountain in northwestern Namibia (Figure 7). It occurs in rock crevices of steep southern and eastern slopes and cliffs of the mountain from ± 1 500 m to ± 2 300 m. It is not common anywhere but occurs scattered in protected fissures and crevices in small to dense groups due to vegetative proliferation. Associated plants in the same habitat include *Aloe dichotoma*, *A. hereroensis*, *A. littoralis*, *Cyphostemma currorii* and *Kalanchoe lanceolata*, also *Diospyros acocksii*, *Euphorbia mauritanica*, *Ficus ilicina*, *Obetia carruthersiana*, *Salvia garipensis* and *Tetradenia riparia*.

In his 1985 revision of the genus *Adromischus*, Toelken recognized 27 taxa. A very handy popular version of the same account was published by Pilbeam *et al.* in 1998,

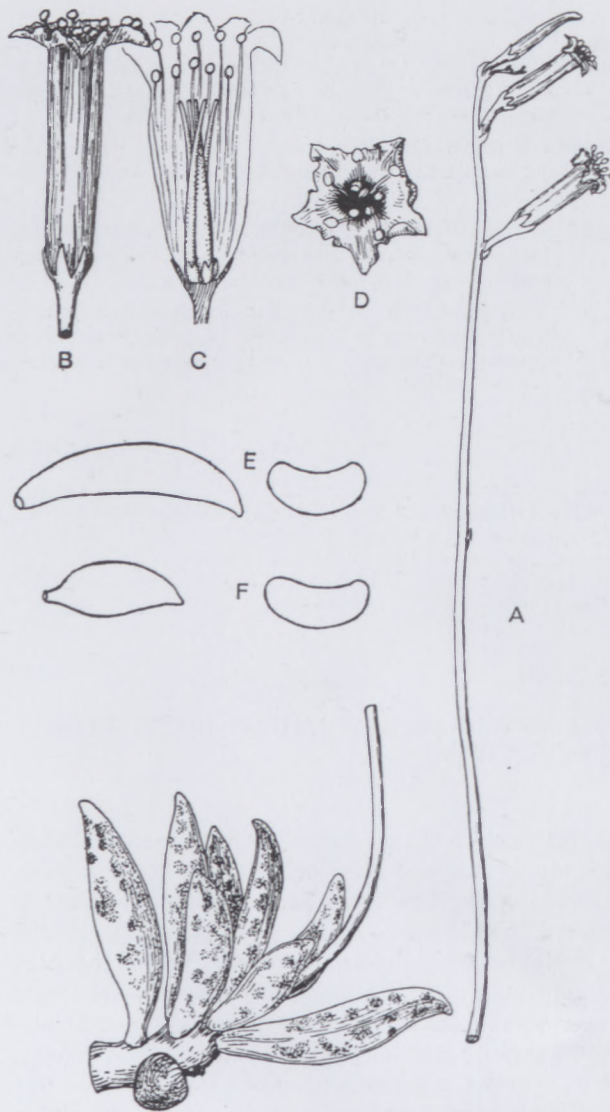


FIGURE 6.—*A. schuldianus* subsp. *brandbergensis* B.Nord. & Van Jaarsv. Illustration based on a cultivated plant that flowered in the Botanical Garden, Lund, Sweden: A, flowering branch, $\times 1$; B, flower, $\times 2.5$; C, corolla, opened to show styles and stamens, $\times 2.5$; D, corolla, dorsal view, $\times 2.5$; E, F, leaf outlines in side view and transect, $\times 1$. Reprinted, with permission, from Nordenstam. Drawn by Bertil Nordenstam.

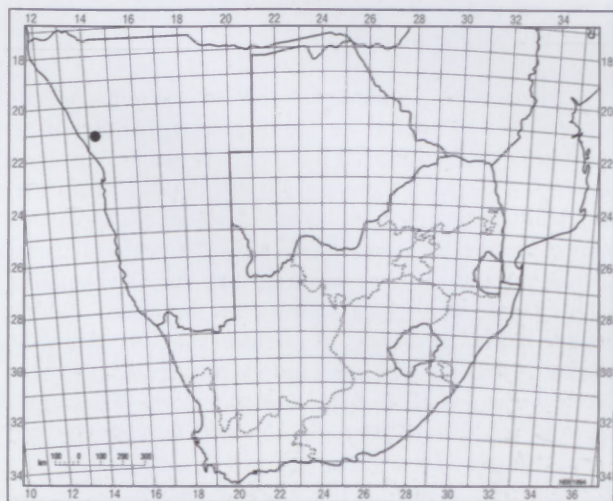


FIGURE 7.—Known distribution of *Adromischus schuldianus* subsp. *brandbergensis*.

reflecting the horticultural value of the group. *Adromischus schuldianus* subsp. *brandbergensis* belongs to section *Boreali* (Toelken 1978) which includes a few other taxa confined to the northern parts of South Africa and Namibia, for example, *A. schuldianus* subsp. *schuldianus*, *A. trigynus* and *A. umbraticola*. From these the new subspecies is at once distinguished by its subfusiform or almost terete leaves distinctly concave on the upper side. It is found the furthest north of any *Adromischus* species.

Of all the members of section *Boreali*, *A. trigynus* has the most southern distribution. It is confined to dolerite outcrops, growing in shallow soil at altitudes above 1 000 m in the Nama-Karoo Biome in an area that receives predominantly summer and autumn rain. *A. trigynus* ranges from southern Namibia and Pofadder in the west to Aliwal North and the southern Free State in the east.

Adromischus umbraticola occurs on south-facing cliffs and in the shallow soil of sandstone and quartzite outcrops on the Highveld of Gauteng, mountains of the North-West and further north to the Blouberg and Chuniespoort (Limpopo). It is common on rocky ridges of the Witwatersrand and in the Magaliesberg range. The vegetation of its habitat consists mainly of dry, short savanna. It has very brittle leaves, and plants often colonize shallow pockets of soil where there is little competition from mesophytic taxa.

Toelken (1985) recognizes two subspecies of *A. schuldianus*, namely subsp. *schuldianus* and subsp. *juttae*, characterized by their oblanceolate to obovate leaves but mainly differentiated by their stem and branch length, 40–80 mm tall, and little branched in subsp. *juttae* as opposed to branches 10–30 mm long in subsp. *schuldianus*, which occurs in arid savanna in central Namibia, from the Erongo and Auas Mountains in the north to near Aus Village and the Karas Mountains in the south. It grows on rock outcrops, usually with a southern aspect. The second subspecies, *A. schuldianus* subsp. *juttae* is confined to the Karasberg in southern Namibia and is differentiated by its longer branches; the plants occur in the Nama-Karoo. Bruyns (1990) noticed variability in the leaf shape of *A. schuldianus* subsp. *schuldianus* on the Brandberg. He found flat- and fusiform-leaved plants occurring together. However, in spite of some local variation, the majority of specimens encountered on the Brandberg are represented by the subterete-leaved plants here described as a distinct subspecies.

The Brandberg is an isolated granite inselberg of $\pm 21 \times 25$ km and Königstein (2 573 m) represents the highest peak in Namibia. It is surrounded by Namib Desert with typical species such as *Welwitschia mirabilis*, annual herbs and grasses, and foothills with woody species including *Acacia montis-usti*, *Adenolobus garipensis*, *Commiphora saxicola*, *C. virgata*, *C. wildii* and *Moringa ovalifolia*. The rainfall on the lower slopes is low (less than 100 mm per annum) and typical of the Namib.

A total of 480 species was recorded from the mountain by Craven & Craven (2000). The vegetation of the Brandberg is slowly transformed with altitude (increase in rainfall, decrease in temperature). At 2 000 m and above it is reminiscent of renosterveld, not unlike the

vegetation found in the winter rainfall Kamiesberg of Namaqualand, and many genera are shared between the two regions. The Brandberg itself has a number of endemics (Nordenstam 1974; Craven & Craven 2000): *Felicia gunillae*, *Hermannia merxmuelleri*, *Lithops gracilidelineata* subsp. *brandbergensis*, *Nidorella nordenstamii*, *Pentzia tomentosa*, *Plumbago wissii*, *Ruellia brandbergensis* and the recently described *Philyrophyllum brandbergense* (Herman 2003). Our new *Adromischus* subspecies brings the total of endemic taxa to nine. A number of other taxa are near-endemic to the Brandberg, being known from one or a few localities outside the Brandberg. The Brandberg is treated by Van Wyk & Smith (2001) as a local focus of endemism within a larger Kaokoveld Centre of plant endemism.

Other material examined

NAMIBIA.—2114 (Uis): Brandberg, Königstein. E slopes, 2 400 m, 31-05-1963, Nordenstam 2837 (cult. in Bot. Garden, Lund, specimen in S); *Bruyns* 3302 (BOL); *Van Jaarsveld* 17969 (NBG).

ACKNOWLEDGEMENTS

We are grateful to Herta Kolberg from the Ministry of Environment and Tourism in Namibia for her assistance.

REFERENCES

- BRUYNS, P. 1990. New plant records from the Brandberg. *Cimbebasia* 12: 161–166.
- CRAVEN, P. & CRAVEN, D. 2000. The flora of the Brandberg, Namibia. In A.H. Kirk-Spriggs & E. Marais, Dãures—biodiversity of the Brandberg Massif, Namibia. *Cimbebasia Memoir* 9: 49–67. National Museum of Namibia, Windhoek.
- HERMAN, P.P.J. 2003. A new species of *Philyrophyllum* (Asteraceae: Gnaphalieae) from Namibia. *Bothalia* 33: 118–120.
- NORDENSTAM, B. 1974. The flora of the Brandberg. *Dinteria* 11: 1–67.
- PILBEAM, J., RODGERSON, C. & TRIBBLE, D. 1998. *Adromischus*. *The Cactus File Handbook* 3. Cirio Publishing Services, Southampton.
- SMITH, G.F., VAN JAARSVELD, E.J., ARNOLD, T.H., STEFFENS, F.E., DIXON, R.D. & RETIEF, J.A. (eds). 1997. *List of southern African succulent plants*. Umdaus Press, Hatfield.
- TOELKEN, H.R. 1978. New taxa and new combinations in *Coryledon* and allied genera. *Bothalia* 12: 377–393.
- TOELKEN, H.R. 1985. Crassulaceae. *Flora of southern Africa* 14: 1–244.
- VAN WYK, A.E. & SMITH, G.F. 2001. *Regions of floristic endemism in southern Africa: a review with emphasis on succulents*. Umdaus Press, Hatfield.
- Our list was compiled from unpublished field notes kept by the authors, as well as from a critical assessment of the published species lists of Nordenstam (1974) and Craven & Craven (2000). Included in the list are 54 species belonging to 17 families, alphabetically arranged according to family, then according to genus and species. We have adopted the definition for succulence provided by Smith *et al.* (1997), namely that a succulent is a plant that stores water in its tissues as a mechanism to survive periods of drought in the growing phase.
- Aizoaceae**
Sesuvium sesuvioides (Fenzl) Verdc. var. *sesuvioides*
Tetragonia
arbuscula Fenzl
calycina Fenzl
- Apocynaceae/Asclepiadaceae**
Hoodia gordonii (Masson) Sweet ex Decne.
Orbea maculata (N.E. Br.) L.C. Leach subsp. *rangeana* (Dinter & A. Berger) Bruyns
Sarcostemma viminalis (L.) R.Br. subsp. *viminalis*
Stapelia
kwebensis N.E. Br.
longipedicellata (A. Berger) L.C. Leach
- Asphodelaceae**
Aloe
asperifolia A. Berger (flats surrounding mountain)
dichotoma Masson var. *dichotoma*
hereroensis Engl. var. *hereroensis*
littoralis Baker
viridiflora Reynolds
- Asteraceae**
Othonna brandbergensis B. Nord.
Kleinia longiflora DC.
- Burseraceae**
Commiphora
glaucescens Engl.
krauseliana Heine
pyracanthoides Engl.
saxicola Engl.
tenuipetiolata Engl.
virgata Engl.
wildii Merxm.
- Crassulaceae**
Adromischus schultdtianus (Poelln.) Poelln. subsp. *brandbergensis* B. Nord. & Van Jaarsv.
Cotyledon orbiculata L. var. *orbiculata*
Crassula
subaphylla (Eckl. & Zeyh.) Harv. subsp. *subaphylla*
tabularis Dinter
Kalanchoe lanceolata (Forssk.) Pers.
- Cucurbitaceae**
Corallocarpus
schinzii Cogn.
welwitschii (Naudin) Hook.f.
- Euphorbiaceae**
Euphorbia
gariiepina Boiss. subsp. *balsamea* (Hiern) L.C. Leach
guerichiana Pax
mauritanica L. var. *mauritanica*
monteiroi Hook.f. subsp. *brandbergensis* B. Nord.
virosa Willd. subsp. *virosa*
- Lamiaceae**
Aeollanthus neglectus (Dinter) Launert
Tetradenia riparia (Hochst.) Codd
- Mesembryanthemaceae**
Aptenia geniculiflora (L.) Bittrich ex Gerbaulet
Hereroa puttkameriana (Dinter & A. Berger) Dinter & Schwantes
Lithops gracilidelineata Dinter
subsp. *brandbergensis* (de Boer) D.T. Cole
subsp. *gracilidelineata*
Mesembryanthemum guerichianum Pax
- Moringaceae**
Moringa ovalifolia Dinter & A. Berger

LIST OF SUCCULENTS RECORDED FROM THE BRANDBERG

To date the most detailed published checklist for the flora of the Brandberg is that by Craven & Craven (2000). In the latter list the authors indicate the growth form for each species/infraspecific entry. Although 'succulent' is one of the growth forms provided for, this state was applied very inconsistently. For example, no *Aloe* is marked as a succulent, whereas this is the prevailing state in the genus. Hence we here provide an updated list of those species with a succulent growth form recorded from the Brandberg. It is hoped that this list will prove useful to workers interested in comparing the Brandberg flora with other areas where the proportion of succulent taxa may differ (e.g. the high Kamiesberg in the Succulent Karoo further south).

Passifloraceae

Adenia

- pechuelii (Engl.) Harms
repanda (Burch.) Engl.

Portulacaceae

Avonia albissima (Marloth) G.D.Rowley

Portulaca

- kermesina N.E.Br.
*oleracea L.

Talinum sp.

Sterculiaceae

Sterculia

- africana (Lour.) Fiori var. africana
quinqueloba (Garcke) K.Schum.

Vitaceae

Cyphostemma

- bainesii (Hook.f.) Desc.
congestum (Baker) Desc. ex Willd & R.B.Drumm.
currorii (Hook.f.) Desc.

Welwitschiaceae

Welwitschia mirabilis Hook.f.

Zygophyllaceae

Zygophyllum simplex L.

E.J. VAN JAARSVELD*†, B. NORDENSTAM**
and A.E. VAN WYK***

* National Botanical Institute, Kirstenbosch, Private Bag X7, 7735 Claremont.

† Student affiliation: Department of Botany, University of Pretoria, 0002 Pretoria.

** Department of Phanerogamic Botany, Swedish Museum of Natural History, P.O. Box 50007, SE-104 05 Stockholm, Sweden.

*** H.G.W.J. Schweickerdt Herbarium, Department of Botany, University of Pretoria, 0002 Pretoria.

MS. received: 2003-08-19.