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ÁNGEL BAÑARES BAUDET

Notes on the taxonomy of *Aeonium urbicum* and *A. appendiculatum* sp. nova *(Crassulaceae)*

Abstract

Bañares Baudet, Á.: Notes on the taxonomy of *Aeonium urbicum* and *A. appendiculatum* sp. nova *(Crassulaceae).* – Willdenowia 29: 95-103. 1999. – ISSN 0511-9618.

Hitherto *Aeonium* (sect. *Leuconium*) *urbicum* has been considered endemic to the islands of Tenerife and La Gomera (Canary Islands). A close morphological examination of the populations on both islands revealed clear differences in taxonomically significant features. These findings justify the recognition of the populations in S Tenerife as a new variety, *A. urbicum* var. *meridionale,* and the segregation of the populations on La Gomera as a new species, *A. appendiculatum*. The new taxa are described and illustrated, their relationships are discussed and a key to the single-stemmed taxa of *A.* sect. *Leuconium* is provided.

Variation of *Aeonium urbicum* on Tenerife

Aeonium urbicum (C. Sm. ex Hornem.) Webb & Berth. of *A.* sect. *Leuconium* is a single-stemmed species, which is considered endemic to the islands of Tenerife and La Gomera (Liu 1989, Bañares 1992). The distribution and ecology of *A. urbicum* on Tenerife was elucidated in some detail by Voggenreiter (1974). Liu (1989) defines *Aeonium* sect. *Leuconium* A. Berger (1930: 429) [= *Aeonium* sect. *Urbica* (Christ) Praeger (1932: 166)] as a monophyletic section comprising 11 species with complicated relationships endemic to the Canary Islands. Recently, Mes (1995) included also *A. nobile* (Praeger) Praeger, which was formerly placed in a section of its own (*A.* sect. *Megalonium* A. Berger 1930: 428).

Aeonium urbicum was first described by Hornemann (1819) based on a collection of Christen Smith made on Tenerife in 1815. Hornemann's diagnosis reads "Caule fruticoso, foliis obovatis, ciliatis in petiolum tetragonum attenuatis. Habitat in Canariis". According to Liu (1989), the holotype should be located in the herbarium of the University of Copenhagen (C), where Hornemann deposited Smith's collection. It was not, however, found there by Liu and my enquiry to the Copenhagen Herbarium confirmed that it is not kept there (Ryding in litt). Hansen (1977) in a brief biography of Christen Smith states that after the premature death of the Danish botanist his Canarian collections were distributed from London to many European herbaria as is noted by Stafleu & Cowan (1985). Professor J. W. Hornemann, then head of the Botanical Garden and Her-

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barium in Copenhagen and also a friend of Christen Smith, received a number of duplicates. This is probably the reason why Liu (1989) assumed that the type collection should be located in Copenhagen. However, a specimen preserved in the herbarium of the British Museum London (BM) was selected and labelled as lectotype by Liu in July 1986, but quoted in his publication as "isotype" (Liu 1989). This specimen consists of an inflorescence branch 21 cm long, glabrous, with few lanceolate, acuminate bracts. The pedicels are 3-5 mm long, the flowers 8-9-merous, the calyx 6 mm wide, glabrous, half divided into triangular acute segments, the petals are glabrous, lanceolate and acuminate; the carpels are glabrous, the ovaries smooth, 3.5 mm long and 1.5 mm wide. There is a second conspecific sample on the sheet, likewise determined by Liu and consisting of three glabrous inflorescence branches collected in June 1892 by R. P. Murray on walls at La Laguna on Tenerife.

Various authors such as Praeger (1929, 1932), Liu (1989) and Bañares & León (1997) noted some morphological variation between populations of *A. urbicum.* Praeger (1929, 1932) reported the species only from Tenerife and mentioned local variation of its leaves (green or glaucous) and flowers (greenish white or pinkish white). Considering the taxonomic importance of this variation, Praeger (1932: 167) stated "as the plant was described from specimens collected (in 1815 by Christian Smith) at La Laguna, where the green-leaved and greenish-white-flowered form prevails, this must rank as the type". On the other hand, Liu's description "petals ... with median portion pink variegated" (Liu 1989: 82) surely corresponds to plants from the southern slopes of Tenerife or from the island of La Gomera, where *A. urbicum* exhibits pinkish white flowers. Nevertheless, the distribution map provided by this author includes extensive sectors of N Tenerife, where *A. urbicum* has greenish white flowers.

Since the colour of the petals in *Aeonium* is taxonomically significant (Liu 1989), I studied the populations on Tenerife. The results confirm Praeger's observation. My examinations revealed also important differences in other characters such as leaf indumentum and carpel morphology between the populations in the north and south of Tenerife, which justify the distinction of two varieties of *A. urbicum*.

Aeonium urbicum (C. Sm. ex Hornem.) Webb & Berth., Hist. Nat. Iles Canaries 3(2.1): 194. 1841 ≡ *Sempervivum urbicum* C. Sm. ex Hornem., Suppl. Horti Bot. Hafn.: 60. 1819. – Lectotype (designated by Liu 1989: 82 [as "isotype"]): [Canary Islands, Tenerife], "in tectis urbicum imprimis Orotavae et Lagunae in barancis region sylvatico minus ...", 1815, *Ch. Smith* (BM 565910!).

Monocarpic subshrub, unbranched, to 1.5 m tall. Stem to 6 cm in diameter, bark grey, slightly fissured, provided with prominent scalelike excrescences when young, leaf scars transversally elliptical, 5-8 × 2-3 mm. Leaf rosettes to 30 cm in diameter. Leaves oblanceolate, 8-14 × 2-5 cm, lamina 3-4 mm thick, glabrate or puberulent, green or glaucous and often marginally reddish, margin ciliate with conical unicellular trichomes 0.5-1 mm long, apex apiculate. Inflorescence dome-shaped, 25-65 × 15-40 cm, glabrous; branches 8-25 cm, with lanceolate, acuminate bracts; pedicels 2-4 mm long, glabrous. Flowers 8-10-merous; calyx 7 mm wide, glabrous, half divided into triangular, acute segments of 2-3 × 1-1.5 mm; petals lanceolate, acuminate, 7-10 × 1.5-2 mm, white, median portion green or pink variegated, glabrous; stamens with white, glabrous filaments and white or pale yellow anthers, the antipetalous ones 6-8 mm, the antisepalous ones 7-10 mm long; carpels glabrous, ovaries 3.5-4.5 × 1.5-2 mm, smooth or adaxially provided with short appendages c. 0.15 mm long, styles divergent from the base or apically; hypogynous scales square, 1 mm, emarginate. Flowering May-June.

Aeonium urbicum var. ***urbicum***
= *Sempervivum retusum* Haw. in Philos. Mag. Ann. Chem. 1: 125. 1827 ≡ *Sempervivum urbicum* var. *retusum* (Haw.) DC., Prodr. 3: 411. 1828.

Leaves glabrate, green; petals white, median portion green variegated; ovaries smooth; styles apically divergent.

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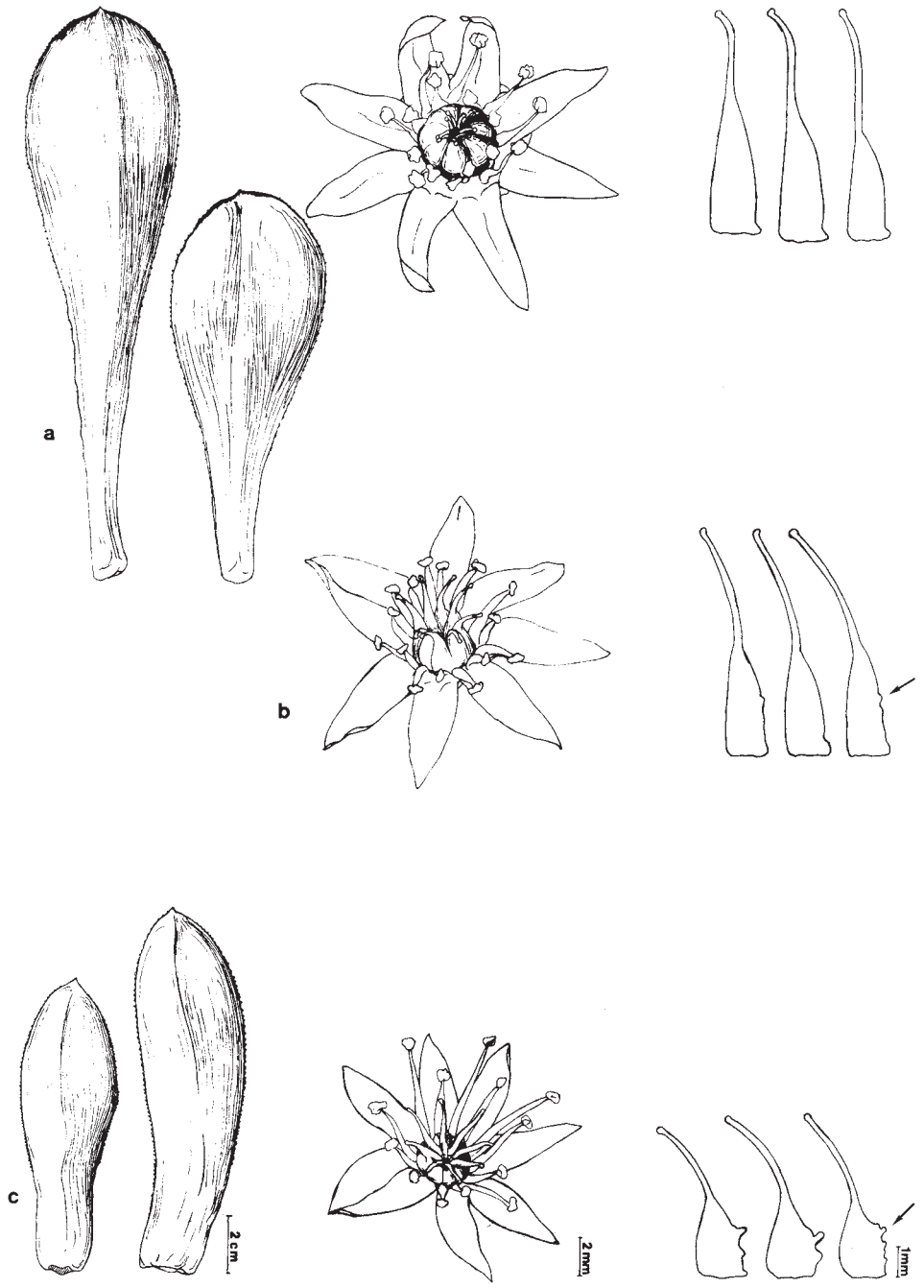

Fig. 1. Leaves, flower and carpels – a: *Aeonium urbicum* var. *urbicum* [after *Bañares 39567* (TFC)]; b: *Aeonium urbicum* var. *meridionale* [after *Bermúdez & Bañares 39569* (TFC)]; c: *Aeonium appendiculatum* [after *Bañares & Marrero 39570* (TFC)]. – Adaxial appendages of ovaries are arrowed.

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Ic.: Fig. 1a; Voggenreiter 1974: 467, 501, 502 (as *A. urbicum*); Praeger 193: 168 (as *A. urbicum*).

Distribution: Common in the northern parts of Tenerife (from Macizo de Anaga to Teno) at altitudes of 50-1000 m, see Fig. 2.

Additional specimens
Spain: Canary Islands: Tenerife: El Palmar (Teno), 500 m, 5.1997, *Bañares 39567* (TFC); La Laguna, 600 m, 7.1997, *Bañares 39568* (TFC).

Aeonium urbicum var. ***meridionale*** Bañares, **var. nova**
Holotypus: Spain, Islas Canarias, Tenerife, Altos de Chirche (carretera de Chio al Parque Nacional del Teide), 1400 m, 6.1998, *O. Bermúdez* & *A. Bañares 39569* (TFC; isotypus: B).

A varietate typica foliis puberulentibus, viridibus vel glaucis, petalis albo-rosaceis ovariis appendicibus brevibus adaxialibus c. 0.15 mm longis saepe instructis et stylis e basi divergentibus differt.

Leaves puberulent, green or glaucous; petals white, median portion pink-variegated; ovaries usually provided with short adaxial appendages c. 0.15 mm long (Fig. 1b, arrowed); styles divergent from the base.

Ic.: Fig. 1b; Bramwell & Bramwell 1990: 134 (as *A. urbicum*).

Distribution: Common in the southern and south-western parts of Tenerife (from Ladera de Güimar to Tamaimo) at altitudes of 350-1800 m, see Fig. 2.

Additional specimen
Spain: Canary Islands: Tenerife: Altos de Chio, 1000 m, 25.5.1995, *Bañares* & *Padilla 36884* (TFC).

Aeonium appendiculatum, a new species from La Gomera

Regarding the presence of *Aeonium urbicum* on the island of La Gomera, Liu (1989) mentions some features in the leaf morphology that differentiate these plants from the populations on Tenerife. A morphological analysis of the Gomeran populations in fact revealed its singularity, in particular with respect to features of its carpel morphology that is not shared by any species in the genus. The populations on La Gomera are therefore described as a new species.

Aeonium appendiculatum Bañares, **sp. nova** – Fig. 1c, 3
Holotypus: Spain, Islas Canarias, La Gomera, Barranco de Benchijigua, 450 m, 6.1996, *Á. Bañares* & *M. V. Marrero 39570* (TFC; isotypus: B).

Planta monocarpica, non ramificata, usque ad 1 m alta. Caulis usque 9 cm diametro, cortice grisea, basi praesertim parce fissurata, laevigata in iuventutem, cicatricibus foliaribus transverse ellipticis, 10-18 mm latis et 4-8 mm altis. Rosulae usque 35 cm diametro. Folia oblanceolata vel subobovata, 11-16 × 2.3-4 cm, lamina apiculata nonnunquam mucronata, 3-5 mm crassa, glabra, glauca, margine ciliis unicellularibus 0.5 mm longis instructo, apice attenuato. Inflorescentia tholiformis, 25-40 × 20-30 cm, glabra; ramis 5-15 cm, bracteis lanceolatis acuminatisque, 25-90 floribus instructi; pedicelli 1.5-3 mm longi, glabri. Flores 8 partiti, 1.4 cm diametro; calyx 4 mm latus, basi rotundata, glaber, divisus in tertia superiore parte usque ad mediam segmentis deltatis 1.2-1.5 mm longis et latis; petala lanceolata, integra, 6-6.3 × 2-2.2 mm, albo-rosacea, glabra; stamina filamentis albis et glabris, antherae luteolae, antipetalis 4-4.5 mm et antisepalis 5-5.5 mm; carpella glabra, ovaria 2-2.5 mm longa et 1.5 mm lata, appendicibus adaxialibus usque 0.4 mm instructa; stylis 3-3.5 mm longis e basi divergentibus; squamae hypogynae quadratae, 0.6 mm, leviter crenatae. Floret inter Maii et Iunii menses.

Monocarpic subshrub, unbranched, up to 1 m tall. Stem up to 9 cm in diameter, bark grey, slightly fissured at the base, smooth when young, leaf scars transversely elliptical, 10-18 mm wide and 4-8 mm tall. Leaf rosettes up to 35 cm in diameter. Leaves oblanceolate to subobovate,

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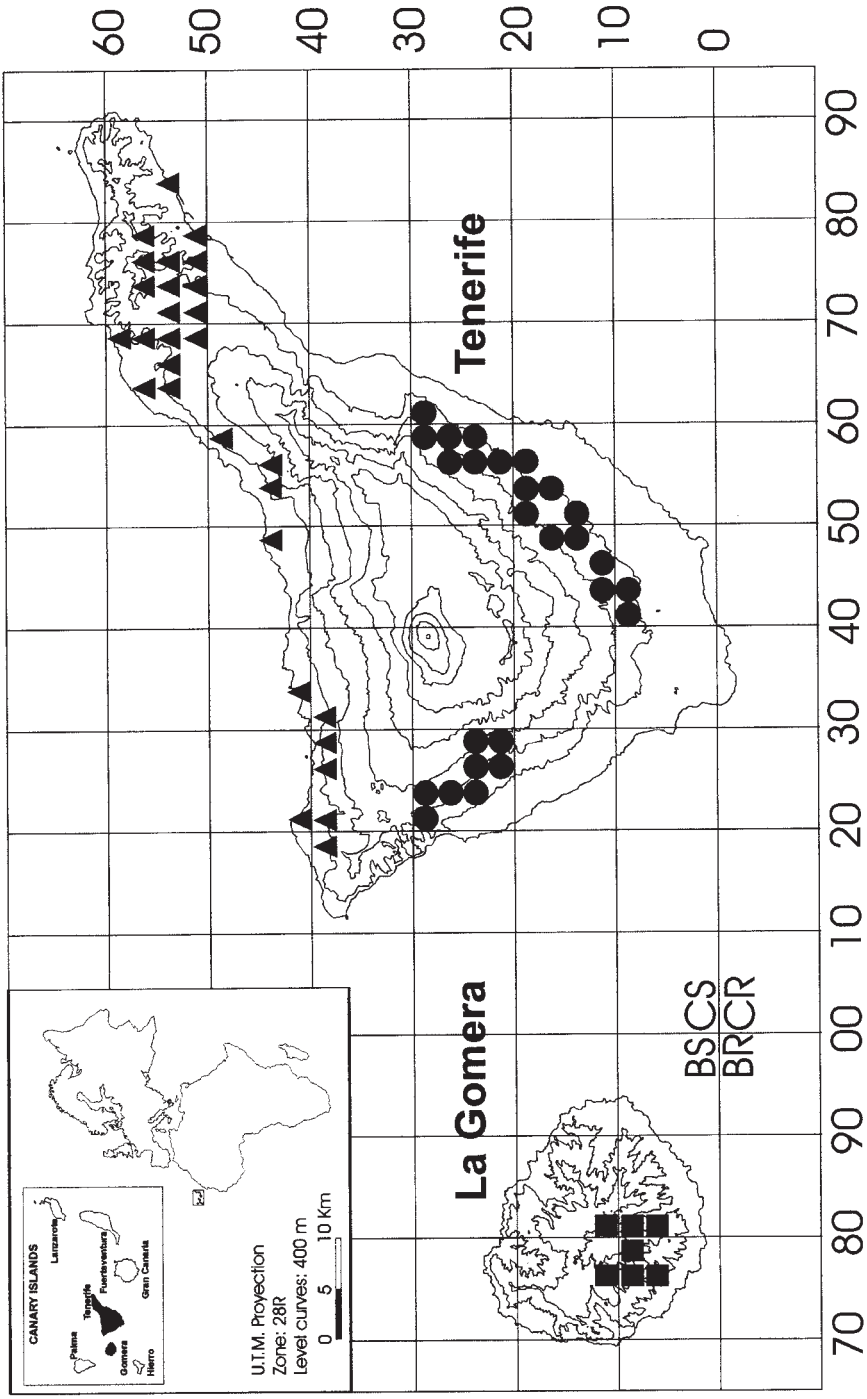

Fig. 2. Distribution of *Aeonium urbicum* (C. Sm. ex Hornem.) Webb & Berth. var. *urbicum* (▲), *Aeonium urbicum* var. *meridionale* Bañares (●) and *Aeonium appendiculatum* Bañares (■).

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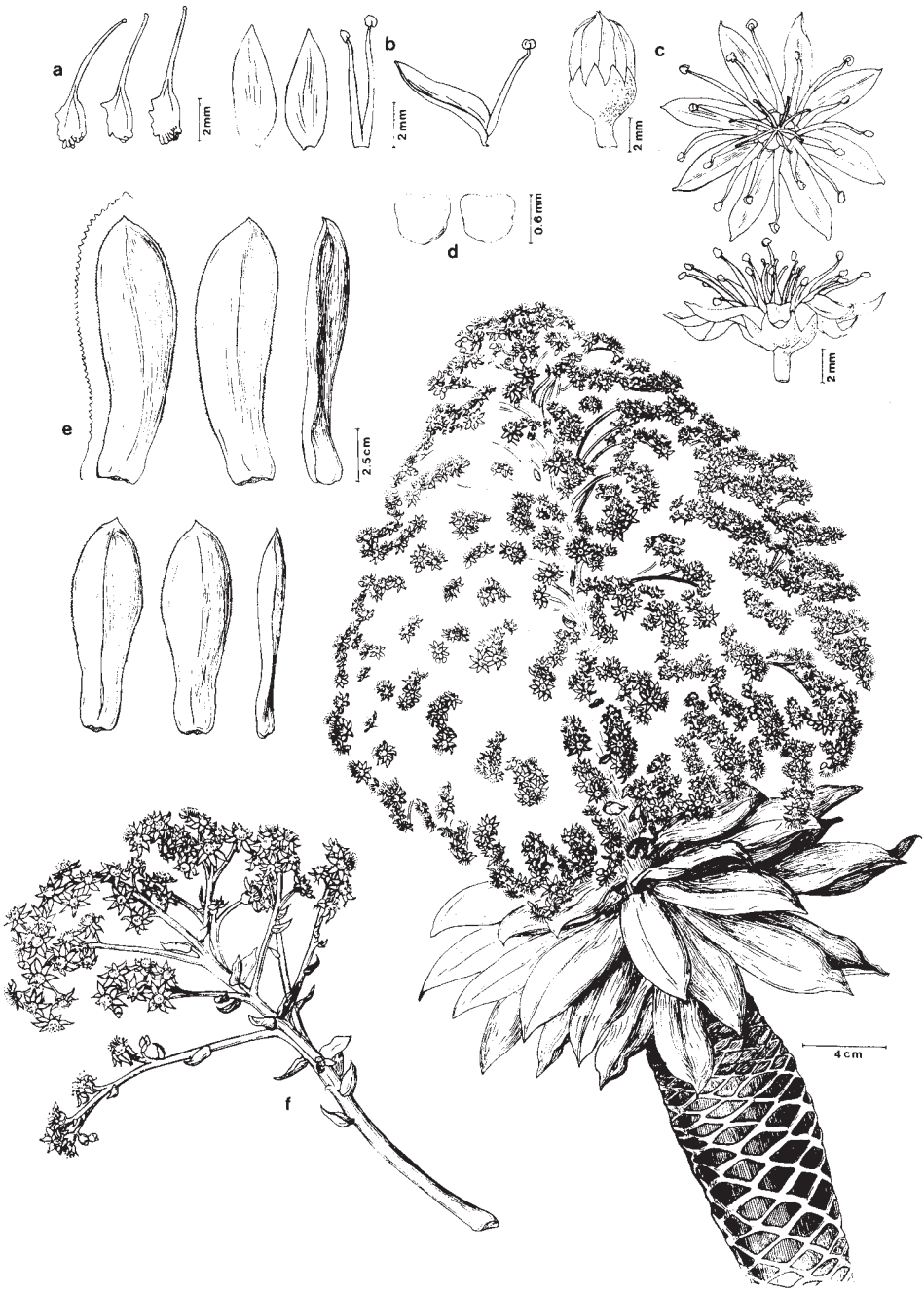

Fig. 3. *Aeonium appendiculatum* Bañares – a: carpels; b: petals and stamens; c: flowers; d: hypogynous scales; e: leaves; f: inflorescence branch. – Drawings after *Bañares & Marrero 39570* (TFC).

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11-16 × 2.3-4 cm, lamina 3-5 mm thick, glabrous, glaucous, margin ciliate with conical unicellular trichomes 0.5 mm long, apex attenuate, strongly apiculate and usually mucronate. Inflorescence dome-shaped, 25-40 × 20-30 cm, glabrous; branches 5-15 cm with lanceolate, acuminate bracts and 25-90 flowers; pedicels 1.5-3 mm long, glabrous. Flowers 8-merous, 1.4 cm in diameter; calyx 4 mm wide, base rounded, glabrous, divided for 1/3 to 1/2 into deltate segments 1.2-1.5 mm long and wide; petals lanceolate, entire, 6-6.3 × 2-2.2 mm, white, median portion pink variegated, glabrous; stamens with white, glabrous filaments and yellow anthers, the antipetalous ones 4-4.5 mm and the antisepalous ones 5-5.5 mm; carpels glabrous, ovaries 2-2.5 mm long and 1.5 mm wide, adaxially provided with prominent appendages up to 0.4 mm long; styles 3-3.5 mm long, divergent from the base; hypogynous scales square, 0.6 mm, slightly emarginate. Flowering May-June.

Distribution: South and central parts of La Gomera, at altitudes of 100-900 m (Fig. 2); common in the proximity of Imada and Barranco de Benchijigua.

Relationships

Aeonium appendiculatum is clearly distinguishable from *A. urbicum* by its thicker stem, smooth bark (never scaly), strongly apiculate and glabrous leaves, smaller and denser inflorescences with shorter branches, smaller and pinkish white petals, basally round (not truncate) and narrower calyx, yellow anthers, ovaries adaxially provided with prominent appendages 0.4 mm long (forming a patent overlapping ring) and styles divergent from the base (never joined and apically divergent).

The new species shows more similarity to *A. urbicum* var. *meridionale* than to the typical variety with regard to the floral morphology, since var. *meridionale* exhibits pinkish white flowers, styles divergent from the base and ovaries with appendages. However, these appendages are much shorter and do not form an overlapping ring. Following Marrero (1992), Liu (1989) and Mes & Hart (1995), it can be assumed that *Aeonium appendiculatum* and *A. urbicum* are closely related, and it can be hypothesized that after a southern and northern variety of *A. urbicum* had evolved on Tenerife by adaptive radiation, plants originating from the southern population established on La Gomera, where due to genetical drift *A. appendiculatum* evolved from such a founder population.

The taxa closest to *Aeonium appendiculatum* are *A. ciliatum* (Willd.) Webb & Berth., *A. haworthii* (Salm-Dyck ex Webb & Berth.) Webb & Berth., *A. urbicum* (C. Sm. ex Hornem.) Webb & Berth. and *A. pseudourbicum* Bañares, which are all endemic to Tenerife, as well as *A. gomerense* (Praeger) Praeger (endemic to La Gomera) and *A. davidbramwellii* H.-Y. Liu (endemic to La Palma). The most important morphological features to distinguish them have been reported by Bañares & León (1997). *A. appendiculatum* differs by its smooth and unbranched stem, glabrous, glaucous, oblanceolate to subovate and strongly apiculate leaves, glabrous inflorescence and sepals, pinkish white petals and glabrous carpels; unique features of the new species are the styles divergent from the base and ovaries with appendages forming a patent overlapping ring.

The branching pattern in subshrubby species of *Aeonium* is taxonomically important (Liu 1989). Regarding their growth architecture the single-stemmed species can be considered as monoaxial trees of 'Holttum's Model' (Hallé & al. 1978). Ecologically, they have the advantage compared to the rest of the species of the *A.* sect. *Leuconium* that they are able to grow in small soil-packets on the escarpments. *A. urbicum* var. *meridionale* and *A. appendiculatum* have glaucous leaves, thus they are well adapted to arid climate. They can be distinguished from the other single-stemmed species of *A.* sect. *Leuconium*, viz. *A. urbicum*, *A. pseudourbicum*, *A. hierrense* (R. P. Murray) Pitard & Proust and *A. nobile* (Praeger) Praeger, by the following key.

Key to single-stemmed species of *Aeonium* sect. *Leuconium*

1 Leaves 3-5 mm thick, margin ciliate; corolla greenish white or pinkish white 2
– Leaves 6-12 mm thick, viscid when young, margin scarcely ciliate and not usually ciliate when mature; corolla reddish yellow . . . . . *A. nobile* (La Palma)

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2 Inflorescence glabrous 3
– Inflorescence pubescent 5
3 Stem with prominent scalelike excrescences when young; calyx 7 mm wide; ovaries 3.5-4.5 × 1.5-2 mm 4
– Stem smooth when young; calyx 4 mm wide; styles divergent from the base; ovaries 2-2.5 × 1.5 mm, adaxially provided with prominent appendages up to 0.4 mm long . . . . . *A. appendiculatum* (La Gomera)
4 Leaves green, glabrate; petals greenish white; ovaries smooth; styles apically divergent . . . . . *Aeonium urbicum* var. *urbicum* (N Tenerife)
– Leaves glaucous, puberulent; petals pinkish white; ovaries usually provided adaxially with short appendages (c. 0.15 mm); styles divergent from the base . . . . . *A. urbicum* var. *meridionale* (S & W Tenerife)
5 Leaves obovate, 5-8 cm wide, margin with abundant strong cilia of 1-2 mm. . . . . *A. hierrense* (La Palma & El Hierro)
– Leaves oblanceolate, 3-4 cm wide, margin with scarce and short cilia (0.2-0.5 mm) . . . . . *A. pseudourbicum* (W Tenerife)

Hybridization

Aeonium appendiculatum hybridizes with *A. decorum* Webb ex Bolle. This hybrid has been described as *A. urbicum* × *decorum* (*A.* ×*perezii* Bañares 1990) and is clearly distinguished from *A. appendiculatum* by its branched habit, scaly stem and inflorescences with pubescent peduncles and flowers.

Several hybrids of *Aeonium urbicum* have been described from Tenerife, exclusively involving the typical variety: *A.* ×*mixtum* Heath is the hybrid with *A. haworthii* (Salm-Dyck ex Webb & Berth.) Webb & Berth., *A.* ×*tabulicum* Bramwell & Rowley ex Heath is the hybrid with *A. tabuliforme* (Haw.) Webb & Berth. and *A.* ×*teneriffae* Heath is the hybrid with *A. ciliatum* (Willd.) Webb & Berth. (Bañares 1990, Heath 1992).

All these hybrids are very local and scattered between their parents due to the absence of intermediate habitats as is generally the case in *Aeonium* (Lems 1960, Praeger 1929). They show intermediate character states and do not obscure the taxonomy of *A. appendiculatum* and *A. urbicum*.

Acknowledgements

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