

ARTICLE

×*Aichrysonium* (Crassulaceae) a new nothogenus of the wild flora of the Canary Islands. Description of ×*Aichrysonium montelongae*

×*Aichrysonium* (Crassulaceae) un nuevo notogénero de la flora silvestre de las Islas Canarias. Descripción de ×*Aichrysonium montelongae*

Octavio Arango-Toro

c. Loreto 24–26, Escalera B, 4^a 2^a, ES-08029 Barcelona, Spain;

Asesor en Crassulaceae de Canarias del Jardín Botánico Marimurtra, Blanes, España

oja.oja@hotmail.com, <https://orcid.org/0000-0002-9712-5402>

Abstract: ×*AICHRYSONIUM* (CRASSULACEAE) A NEW NOTHOGENUS OF THE WILD FLORA OF THE CANARY ISLANDS. DESCRIPTION OF ×*AICHRYSONIUM MONTELONGAE*. — This paper describes ×*Aichrysonium montelongae* (Crassulaceae), the first natural intergeneric hybrid between *Aichryson* and *Aeonium*, fortuitously found in a specimen deposited at the University of La Laguna Herbarium since 1997. The diagnostic process leading to the correct determination of the enigmatic sheet TFC 40.631 and how the parents were inferred is discussed. The morphological, ecological and chorological characteristics identifying the new nothotaxon are analyzed. The genomic affinity between species of the Macaronesian island genera of the subfamily Sedoideae (*Aeonium*, *Aichryson*, *Greenovia*, *Monanthes* and *Sedum*) and their interbreeding ability are discussed. Sheet TFC 40.631 represents the type of the new nothogenus and the holotype of the new nothospecies being described.

Keywords: *Aeonium*; *Aichryson*; Canary Islands; chorology; Crassulaceae; ecology; new nothogenus; taxonomy.

Resumen: ×*AICHRYSONIUM* (CRASSULACEAE) UN NUEVO NOTOGÉNERO DE LA FLORA SILVESTRE DE LAS ISLAS CANARIAS. DESCRIPCIÓN DE ×*AICHRYSONIUM MONTELONGAE*. — En este artículo se describe ×*Aichrysonium montelongae* (Crassulaceae), el primer híbrido natural intergenérico entre *Aichryson* y *Aeonium*, un hallazgo fortuito en un pliego depositado en el Herbario de la Universidad de La Laguna desde 1997. Se comenta el proceso diagnóstico que condujo a la correcta determinación del enigmático pliego TFC 40.631 y cómo se esclarecieron los parentales. Se analizan los caracteres morfológicos, ecológicos y corológicos que identifican el nuevo nototaxón. Se discute la afinidad genómica que existe entre las especies de los géneros de la subfamilia Sedoideae en las islas de la Macaronesia (*Aeonium*, *Aichryson*, *Greenovia*, *Monanthes* y *Sedum*) y la capacidad que estas conservan para cruzarse entre ellas. El pliego TFC 40.631 representa el tipo del nuevo notogénero y el holotipo de la nueva notoespecie.

Palabras clave: *Aeonium*; *Aichryson*; corología; Crassulaceae; ecología; Islas Canarias; nuevo notogénero; taxonomía.

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Supplementary information ↓

INTRODUCTION

The new nothogenus $\times$ *Aichrysonium* Arango, the natural cross between *Aichryson* Webb & Berthel. and *Aeonium* Webb & Berthel., was a fortuitous finding in a sheet deposited in the Herbarium of the University of La Laguna with the number TFC 40.631, erroneously identified as *Aeonium urbicum* (Chr. Smith ex Hornem.) Webb & Berthel., and part of the materials collected for a doctoral thesis (Lucía-Sauquillo, 1998).

The genera of the subfamily Sedoideae in Macaronesia (*Aeonium*, *Aichryson*, *Greenovia* Webb & Berthel., *Monanthes* Haworth and *Sedum* L.) originated from North African *Sedum* that arrived in the Canary Islands, possibly in separate events in time. The current North African species *Sedum jaccardianum* Maire & Wilches, *S. modestum* Ball and *S. surculosum* Cosson are sister species of the Macaronesian clade (Mort *et al.*, 2002; Messerschmidt *et al.*, 2020). Although the islands closest to the African continent, Lanzarote and Fuerteventura, are also the oldest, phylogenetic studies show that the first island to be colonized was Tenerife, and they subsequently dispersed to other islands in the archipelagos of the Canaries, Madeira, and Cape Verde. They may also have made the reverse journey to Morocco, where *Aeonium* and *Aichryson* are also present (Kim *et al.*, 2008).

After an exhaustive morphological analysis of specimen TFC 40.631, its comparison with additional herbarium materials and with living plants to which it might be related, we conclude that it is a new nothogenus of the wild flora of the Canary Islands. The main objective of this work is to describe a new intergeneric hybrid between *Aichryson* and *Aeonium* and to provide the morphological characteristics that distinguish it. The peculiarities of this new nothogenus may offer new insights into the evolution, colonization, and diversification of the genera that make up the alliance in the Canary Islands.

MATERIALS AND METHODS

The study of the materials comprising the two Sheets of the TFC 40.631 specimen was completed with several surveys around La Juncia in the municipality of Los Silos, Tenerife, the locality where the specimen was collected. All taxa of the *Aeonium* alliance that could be related to the new intergeneric hybrid were studied in an area of approximately 5 km² with an elevation range of 200–800 m a.s.l., composed of cultivated lands, ruderal areas, stone walls and thermosclerophyllous forest. This is a fundamental procedure for the clarification of the parents of any new hybrid in nature. The taxa found were the same as those already reported by Lucía-Sauquillo (1998): *A. urbicum* subsp. *urbicum* (L.) Webb & Berthel., *A. arboreum* (L.) Web & Berthel. subsp. *holochrysum* (H.-Y. Liu) Bañares, *A. haworthii* Salm-Dick ex Web & Berthel., *A. tabuliforme* (Haw.) Web & Berthel., *Ai. laxum* var. *laxum* (Haw.) Bramwell, *M. laxiflora* (de Candolle) Bolle ex Bormüller, *M. polyphylla* Haw. and *G. aurea* Chr. Smith ex Hornem. A juvenile specimen compatible with $\times$ *Ai. montelongae* was also found.

Herbarium and fresh specimens were studied using the taxonomic characters established for the genera *Aeonium* and *Aichryson* by Praeger (1932) and Liu (1989). We used a stereomicroscope at 4X to 8X magnification. Metric data were obtained with an electronic digital caliper (BV001 digital caliper, Ireland CE), and small structures were measured using the stereomicroscope on graph paper. For the morphological study and description of the floral structures, two flowers extracted from the *exsiccata* were rehydrated in boiling water for 2 min, then dissected under the stereomicroscope, and the remaining material was dried again and returned to the sheet. All structures useful for diagnosis were digitally photographed, and the images are available to those interested in this type of intergeneric hybrids.

RESULTS

Taxonomic treatment

1.- ×*Aichrysonium* Arango **nothog. nov.**

[*Aichryson* Webb & Berthel. × *Aeonium* Webb & Berthel.].

Type: ×*Aichrysonium montelongae* Arango.

Diagnosis

×*Aichrysonium* displays morphological characters of both genera. Perennial subshrub, size intermediate between the parents, consisting of a basal stem that divides mid-height into dichotomous branches. Rosette leaves medium sized, moderately dense. Leaves oblanceolate-spathulate, glabrescent. Inflorescence conical-ovoid, dense, fully pubescent with capitate and non-capitate hairs of different lengths. Calyx with V-shaped receptacle, sepals long and thin, densely pubescent, similar to those of *Aichryson*. Pedicels long, thin. Flowers with eight parted, slightly cup-shaped corolla like *A. urbicum*. Petals linear-lanceolate, the same width as the sepals, pubescent abaxially. Stamens glabrescent with rounded anthers. Carpels with elongated, adaxially pubescent ovaries, marginal placentation and nectariferous scales with digitate apical border typical of *Aichryson*.

Etymology

The nothogeneric name was created with the fusion of the abbreviated names of the two genera that originate it, *Aichryson* and *Aeonium*.

2.- ×*Aichrysonium montelongae* Arango **nothosp. nov.**

[*Aichryson laxum* var. *laxum* (Haw.) Bramwell × *Aeonium urbicum* subsp. *urbicum*.

(Chr. Smith ex Hornem.) Webb & Berthel.].

Type (**designated here**): España, Islas Canarias, Tenerife, Los Silos, La Juncia (UTM 28RCS 2336), 2.V.1997, *Lucía-Sauquillo, V. & Acosta C.* Holotypus: TFC 40.631. Additional data contributed by us: 316 m a.s.l., 28° 21'38" N, 16° 48' 8" O (**Fig. 1**).



Figure 1. Sheet TFC 40.631 from the Herbarium of the University of La Laguna designated as type of the nothogenus *x Aichrysonium* Arango and holotype of the nothospecies *x Aichrysonium montelongae* Arango (photograph: O. Arango).

Description

Subshrub, probably perennial, intermediate in size between the parents, 30–50 cm tall. Formed by a basal stem that at mid-height divides into two dichotomous branches. Leaf rosette flattened, moderately dense, 5–6 cm in diameter, lax. Phyllotaxy: 8/21. Leaves oblanceolate-spathulate, pubescent, 6 × 1.5 cm, acute, strongly cuneate at base, margin with non-glandular hairs 0.5 mm long, and occasionally some interspersed cilia. Inflorescence a conical-ovoid panicle, 8 × 10 cm, central axis densely pubescent with indumentum consisting of glandular and non-glandular hairs of different lengths. Inflorescence bracts like smaller leaves, which in the rachis are linear-lanceolate. 14–16 floral branches distally dichotomous with two or three floriferous branches each with 4–6 flowers. Calyx with V-shaped receptacle as in *Aichryson*, sepals linear-lanceolate, 4.5 × 1.2 mm, acute, densely pubescent. Pedicels long and slender, 8–12 mm, pubescent. Flowers with 8 (7–9) parts, corolla slightly bell-shaped. Petals linear-lanceolate, 7 × 1.2 mm, as wide as the sepals, possibly cream-yellow, pubescent abaxially. Stamens cylindrical, glabrescent, the antepetals 5.5 mm and the interpetals 7 mm, anthers rounded. Carpels with elongated ovaries, 3.5 × 1 mm, pubescent adaxially. Styles glabrous, 3.5 mm long, stigmae slightly capitate. Nectariferous scales subquadrate, 1 × 0.8 mm, with digitate apical edge as in *Aichryson*. Seeds ovoid-rounded, 1 × 0.5 mm. (Figs. 2–4).



Figure 2. Flowers obtained from sheet TFC 40.631 that were rehydrated for morphological study and description of ×*Aichrysonium montelongae* (photograph: O. Arango).

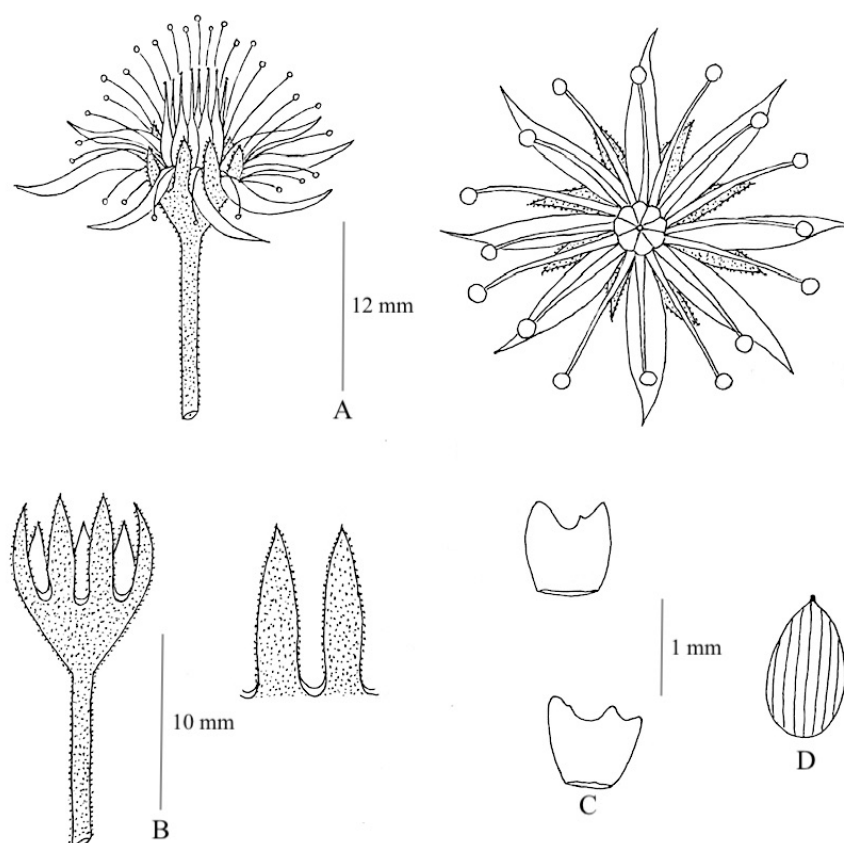


Figure 3. Drawing of the floral structures of *×Aichrysonium montelongae* Arango showing characters inherited from *Aichryson*: (A), petals narrow like sepals; (B), densely pubescent calyx with V-shaped receptacle, long slender pedicels; (C), digitate nectariferous scales; (D), ovoid-rounded seeds (drawing: O. Arango).

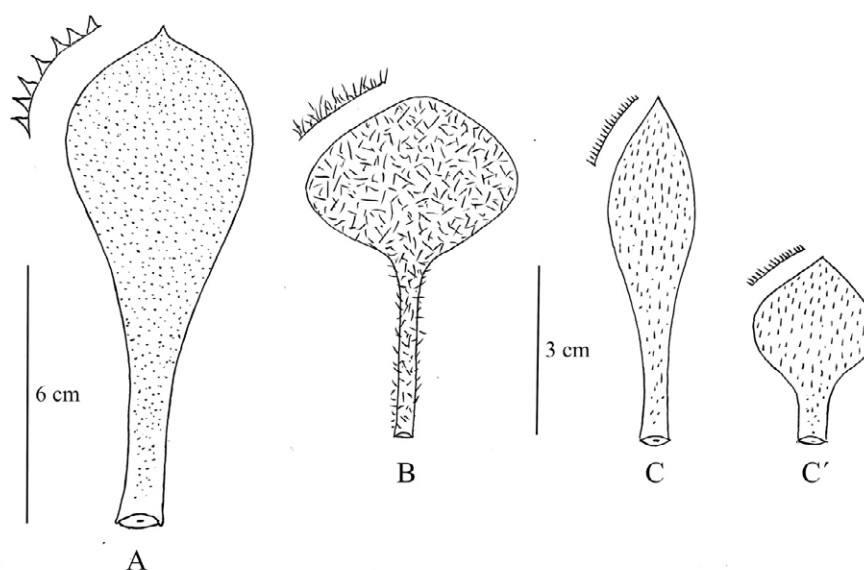


Figure 4. Detail of leaves of the new hybrid and its parents: (A), *Aeonium urbicum* subsp. *urbicum*; (B), *Aichryson laxum* var. *laxum*; (C), *×Aichrysonium montelongae* Arango specimen from sheet TFC 40.631; (C'), Leaf of a juvenile specimen (drawing: O. Arango).

Phenology

Flowering in May.

Etymology

The nothoespecific epithet was named in honor of the Canarian biologist Cristina González Montelongo, professor at the University of La Laguna and head of the TFC Herbarium.

Habitat

This sporadic intergeneric hybrid was found growing in a moderately humid steep area, in the Canary thermosclerophyllous forest vegetation belt, 200–800 m.

DISCUSSION

Inference of parental species.

The progenitors of ×*Ai. montelongae* were discovered based on the unusual morphological characteristics observed in the enigmatic TFC 40.631 herbarium specimen and on the morphological analysis of the taxa present in the area where the specimen was collected. The information provided by the collector of the specimen, an expert on the flora of the Los Silos area, was also invaluable in deducing the progenitors. In our study, *A. urbicum* was inferred to be one of the progenitors due to its resemblance to the hybrid. Furthermore, ×*Ai. montelongae* was found growing within a large colony of *A. urbicum*. A fundamental principle of hybridization in the genus *Aeonium* is that hybrids are always found growing between the parental species, which must be sympatric (Arango, 2024). A detailed study of specimen TFC 40.631 confirmed the presence of the diagnostic characteristics of *A. urbicum* (Table 1). According to the distribution of the *A. urbicum* subspecies (Arango, 2019), the most likely parent is subsp. *urbicum*, although geographically the locality is within the transition zone with subsp. *meridionale* Bañares.

Table 1. Main differential characters of ×*Aichrysonium montelongae* and its two parents.

	× <i>Aichrysonium montelongae</i>	<i>Aichryson laxum</i>	<i>Aeonium urbicum</i> subsp. <i>urbicum</i>
Habit of the plant	Central stem with 2–4 dichotomous branches, pubescent, 30–50 cm tall. Perennial?	Central stem with 8–12 dichotomous branches, densely pubescent, 15–30 cm tall. Bi- or triennial.	Stem single, monocarpous, glabrous, 60–120 cm tall. Perennial.
Indument	Hairs of different lengths, some simple and others glandular, dense.	Hairs of different lengths, some simple and others glandular, very dense.	Extremely short hairs (not visible to the naked eyes), moderately dense.
Leaves	Oblanceolate-spatulate, pubescent, apex acute, base strongly attenuate, margin with 0.5 mm non-glandular hairs.	Ovate to sub-rhomboid, densely pubescent, apex rounded, base attenuate forming a petiole, margin with 0.6–1 mm non-glandular hairs.	Oblanceolate-spatulate, glabrescent, apex obtuse, base attenuate, margin with tiny conical cilia.
Leaf rosettes	Moderately dense, 5–6 cm in diameter.	Lax pseudo-rosette, 4–5 cm in diameter.	Dense, 15–30 cm in diameter.
Inflorescence	Panicle, conic-ovoid, moderately dense, pubescent. Pedicels 8–12 mm, pubescent.	Panicle flattened and lax, pubescent. Pedicels 5–10 mm, pubescent.	Panicle conic dense. Pedicels 3–6 mm, glabrous.
Calyx and receptacle	Sepals linear-lanceolate, long and narrow, pubescent. Receptacle infundibuliform.	Sepals linear-lanceolate, narrow, densely pubescent. Receptacle infundibuliform.	Sepals lanceolate, glabrous. Receptacle cup-shaped.
Flowers	Petals 7–9, linear-lanceolate, as narrow as sepals, abaxially pubescent, color unknown.	Petals 10–12, as wide as sepals, glabrous, yellow.	Petals 8–10, glabrous, yellowish-white with pink or greenish hues.
Nectariferous scales	Subquadrate with digitate apex.	Cuneate with digitate apex.	Quadrate with entire apex.
Seeds	Ovoid-rounded.	Rounded.	Pyriiform.

The other parent was easily deduced from the morphological characters typical of the genus *Aichryson* presented by $\times$ *Ai. montelongae*. These included the profuse pubescence of all plant structures, one of the characters on which **Bramwell (1968)** based his redescription of *Ai. laxum*. Other characters specific to this species found in the hybrid were: the V-shape of the calyceal receptacle, the long slender pedicels, the petals of the same width as the sepals, the rounded anthers and, above all, the unmistakable digitate nectariferous scales of *Aichryson*. The only *Aichryson* species found growing alongside *A. urbicum* was *Ai. laxum* var. *laxum*.

This is undoubtedly a rare hybrid in nature, of which only one juvenile specimen was found at the site where specimen TFC 40.361 had previously been collected (**Fig. 5**). Among the various factors that may influence the rarity of $\times$ *Ai. montelongae* are the biennial or triennial character of *Ai. laxum*, unlike the perennial nature of *A. urbicum*, and also likely genetic alterations due to chromosomal disparity.



Figure 5. Juvenile plant found in the wild showing characters compatible with $\times$ *Aichrysonium montelongae* Arango (photograph: O. Arango).

Chromosome number and experimental hybridization.

We do not know the chromosome number of ×*Ai. montelongae*, but, very likely, it is polyploid, given the different chromosome number of the putative parents, *A. urbicum* $n = 18$ and *Ai. laxum* $n = 15$ (Ardévol Gonzales *et al.*, 1993). When the chromosome number of the parents is different, as in this case, F1 hybridization often occurs by allopolyploidy through unreduced gametes. This mechanism can lead to meiotic errors and alterations in the function of some genes, resulting in reduced seed fertility and poorly viable embryos that fail to fully develop (Ramsey & Schemske, 1998; Wendel, 2000; Adams & Wendel, 2005; Gómez-Martínez *et al.*, 2010; Sattler *et al.*, 2016).

The hybridization between the different genera that form the *Aeonium* alliance in the Canary Islands is rare in the wild, except for the cross between *Greenovia* and *Aeonium* described as ×*Greenonium* by Rowley (1958), of which at least 15 different nothospecies are known from the Canary Islands (Arango, 2023, 2025; Endémicas de Canarias, 2024). However, there is considerable experience regarding artificial hybridization in the alliance, with intergeneric crosses between genera from different islands or archipelagos or even crosses with their continental relatives (Brickell *et al.*, 2016). An example of the latter type of cross is the one we carried out between *A. lindleyi* subsp. *lindleyi* Webb & Berthel. from Tenerife and *Sedum sediforme* (Jacquin) Pau, from the Mediterranean seaboard of the Iberian Peninsula and Morocco; an unpublished cross that we have called ×*Sedonium* (Fig. 6). Other cultivars produced artificially in USA include: *Monanthes* × *Aeonium*, *Aichryson* × *Aeonium* and *Greenovia* × *Monanthes*, and some double and triple crosses among them (unpublished work, A. Scarlet, pers. comm. 2024). The cross *Sempervivum* × *Aeonium*, a cultivar known as ×*Sempronium*, was artificially produced in Europe (Shaw, 2020; Lea & Michael, 2020). However, of all these hybrids, the only one ever found in the wild is ×*Aichrysonium*, described in this article.



Figure 6. Photograph of ×*Sedonium*, an artificial hybrid obtained by crossing *Sedum sediforme* from the Mediterranean basin and *Aeonium lindleyi* subsp. *lindleyi* from Tenerife (photograph: O. Arango).

The relative ability of some taxa of the *Aeonium* alliance in Macaronesia to interbreed is due to the incomplete reproductive barriers acquired during speciation, which fail to prevent hybridization when they come into contact again (Marrero, 1992). Despite the marked morphological differences that these genera have acquired through divergent evolution, they remain closely related genetically. The remarkable interbreeding capacity of these taxa has evolutionary, phylogenetic and systematic implications that reinforce the idea that the merger of the genera *Greenovia* and *Aeonium*, based solely on genomic proximity (Mes, 1995), was not a sound decision. Had it been, all genera of the *Aeonium* alliance would have to be merged into a single genus to maintain coherence.

Nomenclatural review

The literature review of names that could be related to the new nothogenus begins with [Lamarck \(1789\)](#), who described *S. aizoides* Lam., a plant of unknown origin (Madeira or Canary Islands?) that was very popular in gardens at his time. [Praeger \(1932\)](#), called Lamarck's taxon *Ai. ×domesticum* (Praeger) Praeger and considered it to be a garden hybrid whose parents could be *Ai. tortuosum* Webb & Berthel. and *Ai. divaricatum* (Aiton) Praeger or *Ai. punctatum* Webb & Berthel. He also indicated that there was a variegated-leaved form which he called *Ai. ×aizoides* (Lam.) Praeger, a frequent cultivar that can still be seen in some living collections ([Schulz, 2007](#)). [Berger \(1930\)](#) transferred the perennial species of *Aichryson* to the genus *Aeonium* and named Lamarck's (1789) hybrid as *A. aizoides* Berger. The main nomenclatural confusion was caused by [Heath \(1992\)](#) who named this garden hybrid *×Aeonichryson aizoides* (Lam.) Heath (nom. nudum). Shortly afterwards, [Nelson \(1993\)](#) published another new combination for the same garden hybrid and named it *Ai. ×aizoides* (Lam.) E. C. Nelson, which had previously been illustrated by [De Candolle \(1799\)](#). Finally, [Nyffeler \(2003\)](#) concluded that indeed *Ai. ×aizoides* (Lam.) E. C. Nelson is a gardening hybrid that does not exist in nature. Two major online databases, [IPNI \(2024\)](#) and [POWO \(2024\)](#) list the name *Ai. ×aizoides* (Lam.) Heath as a synonym of a cultivar. None of the names published to date corresponds to a natural cross between *Aeonium* and *Aichryson* in the Macaronesian Islands; therefore, *×Ai. montelongae* is the first well-documented taxon originated from a cross between these two genera found in nature.

CONCLUSION

Both natural and experimental hybridization demonstrate the genetic proximity and reproductive compatibility of the taxa that make up the *Aeonium* alliance in the Macaronesian Islands. The name *×Aichrysonium* is established for the new natural nothogenus described in this article, resulting from the cross between the genera *Aichryson* and *Aeonium*. This name is validly published in accordance with the requirements for diagnosis, description, and typification.

Supplementary information ↑

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Supplementary material

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Data availability

Not applicable.

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Competing interests

Not applicable

Statement on the use of Artificial Intelligence

Not applicable.

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