

Sempervivum druentianum (Crassulaceae subfam.
Sempervivoideae), a new endemic species
discovered in the Durance Valley (Dép. Hautes-
Alpes, Region Provence-Alpes-Côte d’Azur,
France), and description of a new nothospecies

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Abstract

SEMPERVIVUM DRUENTIANUM (CRASSULACEAE SUBFAM. SEMPERVIVOIDEAE), A NEW ENDEMIC SPECIES DISCOVERED IN THE DURANCE VALLEY (DÉP. HAUTES-ALPES, REGION PROVENCE-ALPES-CÔTE D’AZUR, FRANCE), AND DESCRIPTION OF A NEW NOTHOSPECIES.— A new species of *Sempervivum* was discovered in southern France and is here named *Sempervivum druentianum*. This new species, which has habitus like that of *S. tectorum*, is mainly characterised by leaves that are always covered with glandular trichomes and carpels that are glandular on the back. To date, only one population is known, but true or alleged hybrids with other *Sempervivum* species have been discovered in the surroundings of the type locality of *S. druentianum*; one of these, *S. ×brigantiacum* (= *S. arachnoideum* × *S. druentianum*), is also present and described here. A key to all taxa belonging to the *S. tectorum* L. group located in southern France is provided.

Key words: France; *S. arachnoideum*; *S. druentianum*; *S. ×brigantiacum*; *S. gr. tectorum*; taxonomy.

Resumen

SEMPERVIVUM DRUENTIANUM (CRASSULACEAE SUBFAM. SEMPERVIVOIDEAE), NUEVA ESPECIE ENDÉMICA DESCUBIERTA EN EL VALLE DEL DURANCE (DPTO. ALTOS ALPES, REGIÓN PROVENZA-ALPES-COSTA AZUL, FRANCIA), Y DESCRIPCIÓN DE UNA NUEVA NOTOSPECIE.— Una nueva especie de *Sempervivum* fue descubierta en el sur de Francia y se denomina aquí *Sempervivum druentianum*. Esta nueva especie, que tiene un hábito como el de *S. tectorum*, se caracteriza principalmente por hojas que siempre están cubiertas de tricomas glandulares y carpelos que son glandulares en el envés. Hasta la fecha, solo se conoce una población, pero se han descubierto híbridos verdaderos o supuestos con otras especies de *Sempervivum* en los alrededores de la localidad tipo de *S. druentianum*; una de ellas, *S. ×brigantiacum* (= *S. arachnoideum* × *S. druentianum*), también está presente y descrita aquí. Se proporciona una clave para todos los taxones pertenecientes al grupo *S. tectorum* L. ubicado en el sur de Francia.

Palabras clave: Francia; *S. arachnoideum*; *S. druentianum*; *S. ×brigantiacum*; *S. gr. tectorum*; taxonomía.

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INTRODUCTION

The genus *Sempervivum* L. s. str. (excl. *Jovibarba* Opiz) is subendemic to the European continent and was most recently recognised as consisting of 40 to 60 species (Gowler & Tebbitt, 1995; ‘t Hart *et al.*, 2003; Thiede & Eggli, 2007). The type of this genus is *S. tectorum* L., established by Parnell (1993: 87), with a lectotype designated from the Clifford herbarium (BM). Unfortunately, the proposed lectotype represents *S. ×fauconnetii* Reut.; therefore, the conservation of the name with a conserved type was proposed (Gallo & Jarvis, 2016: 1431) and recommended (Applequist, 2019: 849). The conservation of the name has facilitated the clarification of the taxonomic application of the binomial *S. tectorum*, which, in some cases, had been used too frequently to identify different taxa (e.g. *S. alpinum* Griseb. & Schenk, *S. riccii* Iberite & Anzal. and, perhaps, *S. boutignyanum* Billot & Gren. in F. Schultz) while in other cases obvious synonymies were not implemented, as in the case of *S. arvernense* Lecoq & Lamotte and *S. andreanum* Wale.

The *S. tectorum* group represents a morphologically variable taxon, which is distributed over a very wide range, including particularly central-west-

ern Europe where it is almost always spontaneous, while in eastern Europe it is frequently cultivated and more or less naturalized (‘t Hart *et al.*, 2003). Research carried out to date has already made it possible to understand, at least in part, the taxonomic complexity of this group but much work remains to be done especially in the westernmost part of its range. This study contributes to a better understanding of the populations of *Sempervivum* in southern France and presents the results of a field-based study of a population of *Sempervivum* discovered near Champcella, in the Durance valley (Dép. Hautes-Alpes, Region Provence-Alpes-Côte d’Azur, France) that was, morphologically and ecologically attributable, at first sight, to *S. tectorum*. A more in-depth study has instead revealed that this population is characterized by peculiar morphological features and a precise geographical distribution beyond that of the *S. tectorum*. This material is described as a new species, named *S. druentianum* L. Gallo.

Several of the morphological traits defining *S. druentianum* are unique and differentiate this new taxon from what is currently interpreted as *S. tectorum*. Especially the glandular pubescence on both the surfaces of the rosette leaves has been observed to be consistently present in the case of *S. druen-*

Table 1. Comparative morphology of *Sempervivum tectorum* L. group.

Taxa/Traits	<i>Sempervivum tectorum</i> L. (incl. <i>Sempervivum andreanum</i> Wale, <i>Sempervivum arvernense</i> Lecoq & Lamotte)	<i>Sempervivum boutignyanum</i> Billot & Gren.	<i>Sempervivum druentianum</i> L. Gallo	<i>Sempervivum riccii</i> Iberite & Anzal.	<i>Sempervivum alpinum</i> Griseb. & Schenk
Leaf induments	Glabrous	Glabrous	Glandular	Glandular	Glabrous
Leaf base color	White	White	White	White	Violet / Purple
Inflorescence shape	Scorpioid	Condensed	Branched but not scorpioid		Condensed
Petals color	White with stripe pink	Green or white with strip pink	White with central green strip, base pink	Pink with white margins	Pink with sometimes stripe white
Filaments indument	Glandular	Glabrous or with some papillae	Glabrous or glandular	Glandular	Always glandular
Carpels induments	Glandular but naked on the back	Glandular but naked on the back	Glandular throughout	Glandular	Glandular but naked on the back

tianum. The trait is reminiscent of the leaf vestiture found in *S. riccii*, a species endemic of central Italy, from which *S. druentianum* can be distinguished by the glandular nature of carpels on abaxial surface vs (as in *S. riccii*) (Table 1).

The hybrid between *S. arachnoideum* L and *S. druentianum*, which is present at the type locality of *S. druentianum*, is here described as *S. ×brigantiacum* L. Gallo. An identification key is presented for morphologically similar taxa in southern of France.

MATERIALS AND METHODS

Comparative morphological, ecological and biological (protandry and protogyny) studies that compare *S. druentianum* with related taxa present in southern France (*S. alpinum*, *S. calcareum* Jord. and *S. tectorum*) were carried out in the field and in the private collection of the author for three years. In addition to the specialised literature on the genus *Sempervivum* as well as French floristic bibliography pertaining to the study area, the more than 200 names that have been included in the synonymys of *S. tectorum* s. l. (L. Gallo, ined.) were considered to rule out the possibility that *S. druentianum* had already been described earlier.

RESULTS (TAXONOMY)

Neither the literature survey nor the study of the more than 200 synonyms attributable to *S. tectorum* s. l. indicated any data associated with *×S. druentianum*. The population of *Sempervivum* of Champcella is therefore not yet known and is here described.

***Sempervivum druentianum* L. Gallo spec. nov.** (Fig. 1)

Type: France, Provence-Alpes-Côte d'Azur, Dép. Hautes-Alpes, between Le Chambon and Chanteloube, neighborhood of Champcella, before the place named "La Bourgea", on the side of the D38, 986 m a.s.l., rocks covered with xerophilous vegetation, 44.711056 N, 06.587453 E, 22–30. VI.2019, L. Gallo & M. Gai (holotype: MRSN-12989) (Fig. 2).

Diagnosis: *Sempervivum druentianum* is very similar to *S. tectorum* but differs in its leaves being glandular on both surfaces (vs. glabrous in *S. tectorum*), and oblanceolate to sometimes rhombous (cf. Stearn 1987: 320, 493) (vs. oblanceolate to linear in *S. tectorum*) and the carpels more or less glandular on the back (vs. glabrous in *S. tectorum*). Other peculiar traits are inconsistently present, including that the filaments are sometimes glabrous at the base and not hairy as in *S. tectorum* and *S. alpinum*, and the inflorescence branches of *S. druentianum* are not scorpioid.

Description: rosette (20)30–60 mm diameter. Leaf erect ± oblanceolate-pyriform (pear-shaped), light green with white base, apex brown-violet apex, 25–35 × 10–14 mm, glandular on both the faces and on the margins. Inflorescence (8)15–25 cm height, branched but not scorpioid, often reddish, with rare bracts; the cauline leaves are similar to rosette leaves, green often reddish, glandular, with long cilia and apex violet. Flowers round in bud, sessile or with very short pedicel (<1 mm), 20 mm of diameter. Petals 13–14, patent, linear, 6–9 × 1.0–1.5 mm, white with central green strip, base pink, sometimes pink-spotted adaxially. Filaments violet, glabrous or glandular. Anthers oval, not mucronate, bronze or violet. Carpels green, glandular throughout. Stylus erect, green, sometimes spotted of violet toward the apex.

Area and habitat: to date, only a single population of *S. druentianum* is known in the Département Hautes-Alpes (Region Provence-Alpes-Côte d'Azur), on the hills near the Durance River at Champcella, between Le Chambon and Chanteloube (St. Crépin) (Fig. 3) at about 1000 m a.s.l., on huge rounded limestone rocks. This locality was strongly affected by the periods of glaciations/deglaciations in the Alps, with a permanence of ice up to 20,000 BP (Jorda *et al.*, 2000; Buoncristiani & Campy, 2004; Rosique, 2004). In the last glacial maximum (LGM), on the French side, the alpine glacier occupied an elevation between 1200 and 400 m a.s.l. with widespread diffusion in the Durance valley and therefore also in the Champcella area, which was covered by the glacier (Buoncristiani & Campy, 2004). Climatically, the area is characterised by strong thermal fluctuations with many cold days and many very hot days. Precipi-



Figure 1. *Sempervivum druentianum* L. Gallo sp. nov.: (A), plants in habitat; (B), habitat at the type-locality of Champcella (Dép. Hautes-Alpes. Region Provence-Alpes-Côte d'Azur. France); (C), close-up of the rosettes; (D), putative hybrid *S. druentianum* × *S. tectorum* L. (not in the type-locality); (E), close-up of an inflorescence.

tation is highest in autumn and lowest in summer, a Mediterranean type rainfall pattern, with consequent atmospheric aridity in the vegetative period, which is increased by the very high insolation rate (Bardin, 1967; Guiter, 1975). Péguy (1947) exhaustively compared environmental parameters between different localities of the Durance Valley. In the neighbourhood of Guillestre at 980 m a.s.l., which is close to Champcella (type locality of *S. druentianum*), annual rainfall of 690 to 763 mm

was recorded. Widmann (1950) reported rainfall at the well-known location of *Juniperus thurifera* L. at St. Crépin, which is opposite that of *S. druentianum*, on the left of the valley, of 744 mm. Rain is mainly concentrated between September and October while the winter appears rather dry (see also Braun-Blanquet, 1922); moderate rainfall from April to June is of little use for the vegetation due to the wind and the strong insolation (Widmann, 1950). The area comprising Gap and



Figure 2. Holotype of *Sempervivum druentianum* L. Gallo (MRSN-12989) (photograph: F. Longo).

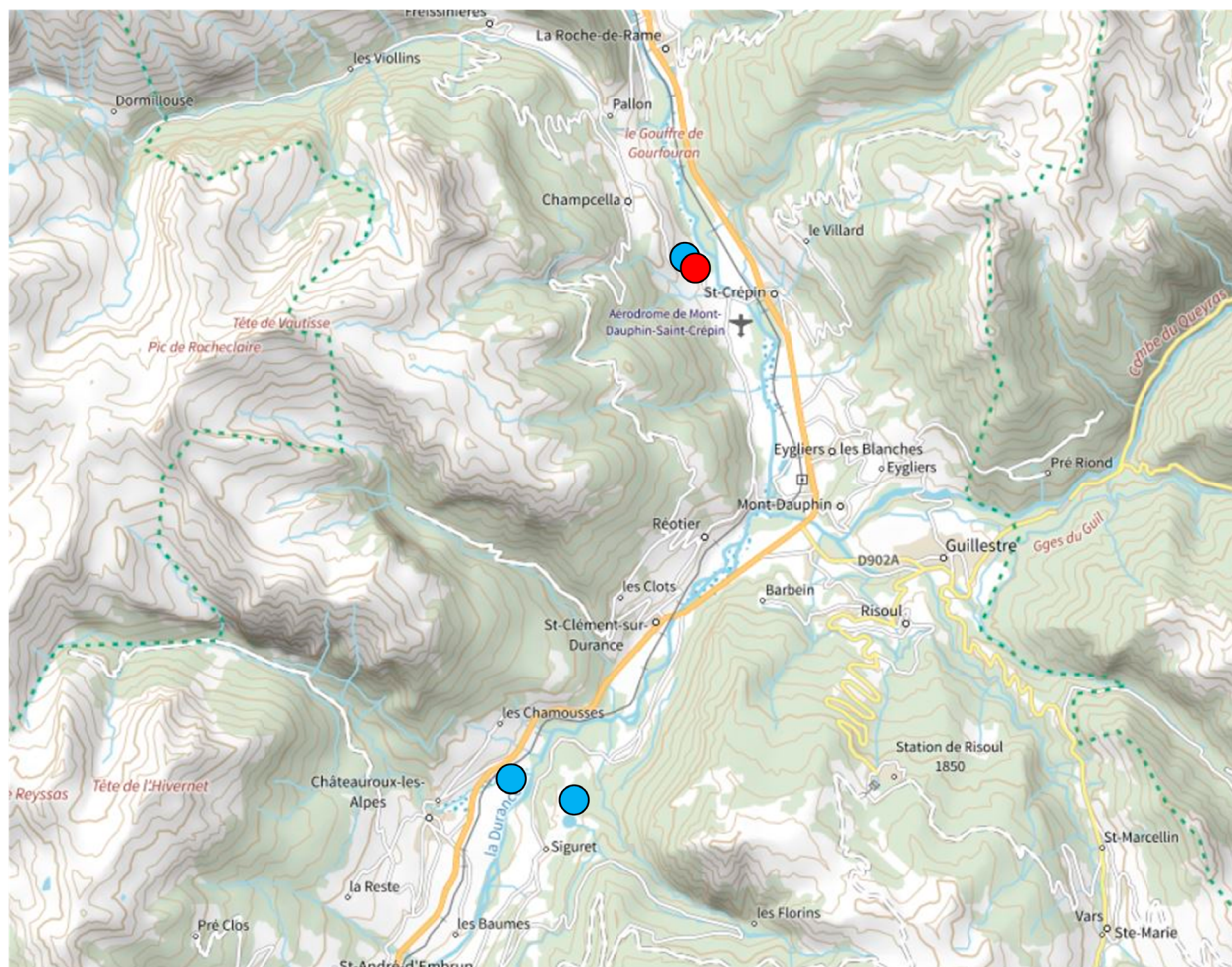


Figure 3. Natural populations of *Sempervivum druentianum* L. Gallo (red circle) and *S. xbrigantiacum* L. Gallo (blue circle).

Sisteron is located on the boundary between the Mediterranean region that is characterised, at least potentially, by *Quercus pubescens* Willd. and an alpine forest with prevailing *Pinus sylvestris* L. (Braun-Blanquet, 1922; Breistroffer, 1946; Widmann, 1950; Ozenda, 1966; Richard & Tonnel, 1987; Garraud, 1998) on dry, calcareous soils. The type locality of *S. druentianum* is located near 1000 m, but it is possible to hypothesize that the range of its elevation may be between 750 and 1500 m in the area near the Mediterranean zone, where *Sedetum brigantiacum* Br.-Bl. is a pioneer on rocks overlain with little calcareous soil (Ozenda, 1966). These plants along with several other representatives of the Crassulaceae are exposed to drought conditions and frost (Bardin, 1967). *Sempervivum druentianum* has very limited natural

geographical distribution range and its remarkable morphological similarity to *S. tectorum*, together with taxonomic confusion in the genus *Sempervivum* as a whole, have delayed its recognition as a new species.

Phenology: *Sempervivum druentianum* predominantly flowers in July. The first flowers opened on 24 June (during the 2019 season) and the last flower opened on the 3 August (during the 2014 season).

Etymology: from Druentia, old classic name of the Durance River where, in its surroundings, *S. druentianum* has been found. This name was cited by some classic authors and sometimes reported as Durentia, Drancia, Drance, etc. (Alessio, 1949).

Remarks: despite repeated field expeditions in the vicinity of Champcella, no other populations of *S. druentianum* have been found. However, traces

of its former presence, in the form of hybrids with other species, such as *S. arachnoideum*, have been identified in two locations not far from Champcella: at the Plateau d'Herbonne (Châteauroux-les-Alpes) between 900 and 930 m a.s.l. and at the Lac de Siguret (Embrun) between 1060 and 1100 m. No other species belonging to the *S. tectorum* group were found at the type locality of *S. druentianum*, although near La Roche-de-Rame, a population of *S. alpinum* was located by the author (GL-9007).

Different distributions of the *S. tectorum* group were reported in Chas (1994: 203) and *Atlas en ligne de la flore du département des Hautes-Alpes* (SAPN-GF, 2022), where *S. alpinum*, *S. tectorum* and perhaps hybrids between them, all been brought together under the same name (*S. tectorum*), which have not yet been separated. Another species of the *S. tectorum* group found in this area is *S. calcareum*, which reaches the northern limit of its distribution range at Lac de Serre-Ponçon (Embrun) (see SAPN-GF, 2022), about 30 km north from the type locality of *S. druentianum*.

Key for the species of *S. tectorum* group in southern France:

1. Rosette leaves glandulose2
- . Rosette leaves glabrous3
2. Carpels glabrous on the back, petals white-green*S. calcareum*
- . Carpels glandular throughout, petals white-pinkish, filament glabrous or papillate...*S. druentianum*
3. Leaves glaucous with apical rhombic red or red-brown dot, filament glabrous...*S. calcareum* (excl.type locality with glandular leaves)
- . Leaves green or glaucous with or without apical rhombic red dot, filament glandulose.....4
4. Leaves green with red-brown apical red-brown dot and base white.....*S. tectorum*
- . Leaves green or glaucous without apical red dot and with base violet.....*S. alpinum*

Many clumps of *S. arachnoideum* were found around *S. druentianum* occurs, and also material identified as a natural hybrid between both species, which is described here:

Sempervivum ×*brigantiacum* L. Gallo **hyb. nov.** (Fig. 4)

Type: France, Provence-Alpes-Côte d'Azur, Dép. Hautes-Alpes, between Le Chambon and Chanteloube, neighborhood of Champcella, before the place named "La Bourgea", on the side of the D38, 991 m a.s.l., rocks covered with xerophilous vegetation, 44.710783 N, 06.586438 E, 22–30. VI.2019, L. Gallo & M. Gai (holotype: MRSN-12990) (Fig. 5).

Diagnosis: hybrid of *S. arachnoideum* and *S. druentianum*, very similar to *S. ×fauconnetii*, differing (with difficulty) by the darker color and the more leathery texture of the leaves of the latter. The presence of red-headed glands in the inflorescence of *S. ×brigantiacum* may also help to distinguish it from [these are morphological characters that are present in natural populations and cannot be overlooked. We must be honest and say that there are objective difficulties in determining them] *S. ×fauconnetii*. The distinction from *S. ×luisae* L. Gallo is much easier because of the presence of glandular trichomes on the surfaces of the leaves of the latter, which are absent in *S. ×druentianum* (Table 2).

Description: rosette 25–35 mm diameter. Leaf green, erect and linear, without red or brown spots at apex and with white base; glabrous on surfaces with long sinuous marginal cilia, little-tufted at apex. Inflorescence 18–25 cm tall, bifurcated, robust, green sometimes reddish, with long branches and rare bracts; many (also 20 or more) flowers. Caulinar leaves glandular with cilia on the margin; glands often red and not diaphanous. Flowers round or slightly elongated in bud, 20 mm diameter, with a long pedicel, covered with red glands. Petals nine, patent or somewhat decumbent, linear and not much lanceolate at base, pink with central dark line, sometimes green with white margins. Filaments violet, glandular. Anthers oval, not mucronate, violet. Carpels green, glandular but not on the back. Stylus green, violet at the apex, erect at the anthesis.

Area and habitat: the type locality is close to that of *S. druentianum* but *S. ×brigantiacum* was found in two other places on either side of the Durance: at Lac de Siguret (Embrun) where the presence of *S. druentianum* has not was doubtful (only sterile specimens viewed to date, so the distinction



Figure 4. *Sempervivum ×brigantiacum* L. Gallo nothosp. nov.: (A), clump of flowering rosettes; (B), close-up of a rosette with tufts of trichomes at the tip of the leaves; (C), inflorescence with emphasis on the lanceolate petals; (D), parents of the hybrids (*S. arachnoideum* L. and *S. druentianum* L. Gallo).

Table 2. Comparison table among *Sempervivum ×brigantiacum* and the parents *Sempervivum arachnoideum* and *Sempervivum druentianum*.

Morphological traits	<i>Sempervivum arachnoideum</i> L.	<i>Sempervivum ×brigantiacum</i> L. Gallo	<i>Sempervivum druentianum</i> L. Gallo
Leaves apex (color)	Green or red	Green	Brown-violet
Leaves apex (induments)	Long arachnoideus	Long sinuous marginal cilia, little-tufted at apex	Absent
Leaves shape	Linear	Linear	Obovate with apex cuspidate
Leaves induments	Glandular	Glabrous	Glandular
Petals shape	Lanceolate	Lanceolate/linear	Linear
Carpels induments	Glandular but not on the back	Glandular but not on the back	Glandular everywhere



Figure 5. Holotype of *Sempervivum xbrigantiacum* L. Gallo (MRSN-12990) (photograph: A. Pepe).

from hybrids with *S. alpinum* or *S. calcareum* is not certain) and Plateau d'Herbonne (Château-roux-les-Alpes) where the presence has yet to be confirmed (Fig. 3).

Etymology: the nothospecific epithet originates from “Brigantium”, the ancient name of the town of Briançon, which is in the neighborhood was found the type locality of *S. ×brigantiacum*.

Living specimens examined

Sempervivum druentianum L. Gallo. France, Dép. Hautes-Alpes, Provence-Alpes-Côte d'Azur: Tra le Chambon e Chanteloube, prima di La Bourgea a lato della D38, 989 m a.s.l., 44.711131 N, 06.587540 E, 5.VII.2019, *L. Gallo* (GL-8868, GL-8936, GL-8937, GL-8939, GL-8943); between Le Chambon e Chanteloube, neighborhood of Champcella, before the place named “La Bourgea”, on the side of the D38, 991 m a.s.l., rocks covered with xerophilous vegetation, 44.710783 N, 06.586438 E, 31.VII.2020, *L. Gallo* (GL-9021, GL-9022, GL-9023, GL-9024, GL-9025).

Sempervivum ×brigantiacum L. Gallo. France, Dép. Hautes-Alpes, Provence-Alpes-Côte d'Azur : between Le Chambon e Chanteloube, neighborhood of Champcella, before the place named “La Bourgea”, on the side of the D38, 991 m a.s.l., rocks covered with xerophilous vegetation, 44.710783 N, 06.586438 E, 31.VII.2020, *L. Gallo* (GL-9020).

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REFERENCES

- Alessio, G. 1949. Une nouvelle base hydronymique méditerranéenne: *drava. *Revue Internationale d'Onomastique*, 4: 233–256. <https://doi.org/10.3406/rio.1949.1120>
- Applequist, W. L. 2019. Report of the Nomenclature Committee for vascular plants: 70. *Taxon* 68(4): 849. <https://doi.org/10.1002/tax.12113>
- Bardin, R. 1967. Introduction à l'étude écologique de quelques groupements végétaux de Haute-Durance. *Bulletin Mensuel de la Société Linnéenne de Lyon* 36(3): 122–126. <https://doi.org/10.3406/linly.1967.5907>
- Braun-Blanquet, J. 1922. Une reconnaissance phytosociologique dans le Briançonnais. *Bulletin de la Société Botanique de France* 69(6): 77–103. <https://doi.org/10.1080/00378941.1922.10833519>
- Breistroffer, M. 1946. Supplément au catalogue des plantes vasculaires des Basses-Alpes. *Bulletin Mensuel de la Société Linnéenne de Lyon* 15: 46–56. <https://doi.org/10.3406/linly.1946.8264>
- Buonocristiani, J.-F. & Campy, F. 2004. The palaeogeography of the last two glacial episodes in France: the Alps and Jura. In: Ehlers J. & Gibbard P. L. (Eds.), *Quaternary Glaciations Extent and Chronology. Part I: Europe. Developments in Quaternary Science* 2: 101–110. [https://doi.org/10.1016/S1571-0866\(04\)80059-9](https://doi.org/10.1016/S1571-0866(04)80059-9)
- Chas, E. 1994. *Atlas de la flore des Hautes-Alpes*. Conservatoire botanique national alpin de Gap-Charance, Conservatoire des espaces naturels de Provence et des Alpes du Sud & Parc National des Écrins, Gap.
- Gallo, L. 2012. *Sempervivum ×luisae* Gallo (Crassulaceae) hybr. nov., endemico dell'Italia centrale [*Sempervivum ×luisae* Gallo (Crassulaceae) hybr. nov., endemico to central Italy]. *Annali del Museo Civico di Rovereto* 27: 287–296 [in Italian].
- Gallo, L. & Jarvis, C. E. 2016. Proposal to conserve the name *Sempervivum tectorum* (Crassulaceae) with a conserved type. *Taxon* 65(6): 1431–1432. <https://doi.org/10.12705/656.22>
- Garraud, L. 1998. Les étages de la végétation dans le sud-est de la France. *Bulletin Mensuel de la Société Linnéenne de Lyon* 67(7): 188–190. <https://doi.org/10.3406/linly.1998.11233>
- Gowler, Z. R. & Tebbitt, M. C. 1995. *Sempervivum* Linnaeus. In: Cullen, J., Knees, S. G. & Cubey, H. S. (Eds.), *The European Garden Flora* (1st ed.) 4(2). Cambridge University Press, Cambridge: 232–239.
- Guiter, J. 1975. Climatologie comparée de quelques vallées alpines et pyrénéennes. *Revue de Géographie Alpine* 63(3): 379–391. <https://doi.org/10.3406/rga.1975.1427>
- Jorda, M., Rosique, T. & Evin, J. 2000. Premières datations ¹⁴C de dépôts morainiques du Pléniglaciaire supérieur de la moyenne Durance (Alpes méridionales, France), Implications géomorphologiques, paléoclimatiques et chronostratigraphiques. *Comptes Rendus de l'Académie des Sciences* 331(3): 187–188.
- Opiz, F. M. 1852. Seznam rostlin květeny české [List of plants of the Czech flora]. In: *Malá Encyklopedie Nauk*. Nakladem Ceskeho Museum, Prague 10: 55 [in Czech].
- Ozenda, P. 1966. Perspectives nouvelles pour l'étude phytogéographique des Alpes du Sud. *Documents pour la Carte de la Végétation des Alpes* 4: 3–198.
- Parnell, J. 1993. *Sempervivum* L. In: Jarvis, C. E. & International Association for Plant Taxonomy (Eds.), *A list of Linnaean generic names and their types*. International Association for Plant Taxonomy (IAPT), Koeltz Scientific Books, Königstein: 87.
- Péguy, C.-P. 1947. Haute Durance et Ubaye (suite): climat, végétation, eaux, glaciers. *Revue de Géographie Alpine* 35(4): 585–737. <https://doi.org/10.3406/rga.1947.5261>
- Richard, L. & Tonnel, A. 1987. Contribution à l'étude des vallées internes des Alpes occidentales. Première partie: originalité du milieu et quelques conséquences biologiques. *Documents de Cartographie Écologique* 30: 113–136.
- Rosique, T. 2004. La dernière phase glaciaire de la moyenne Durance (région de Gap à Sisteron): bilan des recherches,

- dernières conclusions chronologiques. *Méditerranée* 102: 25–36. <https://doi.org/10.3406/medit.2004.3336>
- SAPN-GF [Société Alpine de Protection de la Nature-Groupe Flore] 2022. *BdFlore05: Atlas en ligne de la flore du département des Hautes-Alpes*. Retrieved on February 22, 2022, from <http://bdflore05.org/index.php>
- Stearn, W. T. 1987. *Botanical Latin* (new ed.). David & Charles Publishers, Newton Abbot, London.
- ‘t Hart, H., Bleij, B. & Zonneveld, B. J. M. 2003. The genus *Sempervivum*. In: Eggli, U. (Ed.), *Illustrated Handbook of Succulent Plants: Crassulaceae*. Springer, Berlin & Heidelberg: 332–349.
- Thiede, J. & Eggli, U. 2007. Crassulaceae. In: Kubitzki, K. (Eds.), *Flowering plants. Eudicots. The Families and genera of vascular plants* 9. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-540-32219-1_12
- Widmann, M. 1950. Le Genévrier thurifère dans les Hautes-Alpes. *Revue de Géographie Alpine* 38(3): 493–508. <https://doi.org/10.3406/rga.1950.4067>