

# *Sedum dasyphyllum* subsp. *glanduliferum*: a new addition for the flora of northwestern Spain

**Giovanni-Breogán Ferreiro-Lera**

Department of Biodiversity and Environmental Management (Botany Area), Universidad de León. E-24071 León, Spain 

**Ángel Penas**

Department of Biodiversity and Environmental Management (Botany Area), Universidad de León. E-24071 León, Spain 

**Raquel Alonso-Redondo**

Department of Biodiversity and Environmental Management (Botany Area), University of León. E-24071 León, Spain 

**Aitor Álvarez-Santacoloma**

Department of Biodiversity and Environmental Management (Botany Area), University of León. E-24071 León, Spain 

**Alejandro González-Pérez**

Environmental Geography Research Center, National Autonomous University of Mexico (UNAM). 58190 Morelia, Michoacán, México 

**Norma-Yolanda Ochoa-Ramos**

Department of Biodiversity and Environmental Management (Botany Area), University of León. E-24071 León, Spain 

**Sara del Río**

Department of Biodiversity and Environmental Management (Botany Area), University of León. E-24071 León, Spain   
Mountain Livestock Institute CSIC-ULE. E-24346 Vega de Infanzones, León, Spain.

<https://doi.org/10.5209/mbot.98785>

Received: 5 October 2024 / Accepted: 11 March 2025 / Published online: 1 July 2025

**Abstract.** *Sedum dasyphyllum* L. has a controversial infraspecific treatment, with three subspecies distinguished based on the abundance of glandular indumentum. *Sedum dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman, characterized by the presence of abundant glandular hairs, was considered a subspecies with a southern tendency, with very few and unclear records in the northwestern Iberian Peninsula. In the present study, 56 herbarium sheets from the LEB FCO and SANT herbaria were assigned to the taxa *Sedum dasyphyllum* L. and *Sedum dasyphyllum* L. subsp. *dasyphyllum* were analyzed. Of these, 45 were re-assigned to *Sedum dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman, constituting the first records for this taxon in the provinces of León, Lugo, Oviedo, Orense, Palencia, and Santander. Moreover, five sheets were re-assigned to *Sedum dasyphyllum* L. subsp. *dasyphyllum*, while another five retained their original assignment (*Sedum dasyphyllum* L. subsp. *dasyphyllum*). The populations are now identified as *Sedum dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman do not appear to occupy more southern enclaves or southern slopes, although they are, on average, found at higher altitudes within the study area.

**Keywords:** Glandular indument, LEB herbarium, northwestern Iberian Peninsula, preserved plants, province of León, *Sedum dasyphyllum* subsp. *glanduliferum*.

**How to cite:** Ferreiro-Lera, G.B., Penas, A., Alonso-Redondo, R., Álvarez-Santacoloma, A., González-Pérez, A., Ochoa-Ramos, N.Y. & del Río, S. 2025. *Sedum dasyphyllum* subsp. *glanduliferum*: a new addition for the flora of northwestern Spain. *Mediterr. Bot.* 46(2), e98785. <https://doi.org/10.5209/mbot.98785>

## Introduction

The genus *Sedum* L. is the largest within the family Crassulaceae J.St.-Hil., with an estimated 420 to 500 species ('t Hart, 1991; Nikulin, 2016). The taxonomic treatment by Castroviejo & Velayos (1997) for *Flora Iberica* recognizes 31 *Sedum* L. species in the Iberian Peninsula, six of which (*S. arenarium* Brot., *S. candollei* Raym.-Hamet, *S. lagascae* Pau, *S. nevadense* Coss., *S. pedicellatum* Boiss. & Reut., and *S. pruinaum* Brot.) are endemic. These authors

do not recognize the subgenera established by 't Hart (1995) but instead establish a single section *Sedum* with up to 16 series, some of which have recently received support as monophyletic groups (Messerschmid *et al.*, 2020). One such series, the series *Dasyphylla* 't Hart, is morphologically defined by "Glandular-pubescent indumentum, alternate or decussate leaves, pentamerous pedicellate flowers, white to pink petals, erect follicles with numerous seeds, and seeds with ribbed testa and acute apex" ('t Hart, 1991). This section tentatively includes the

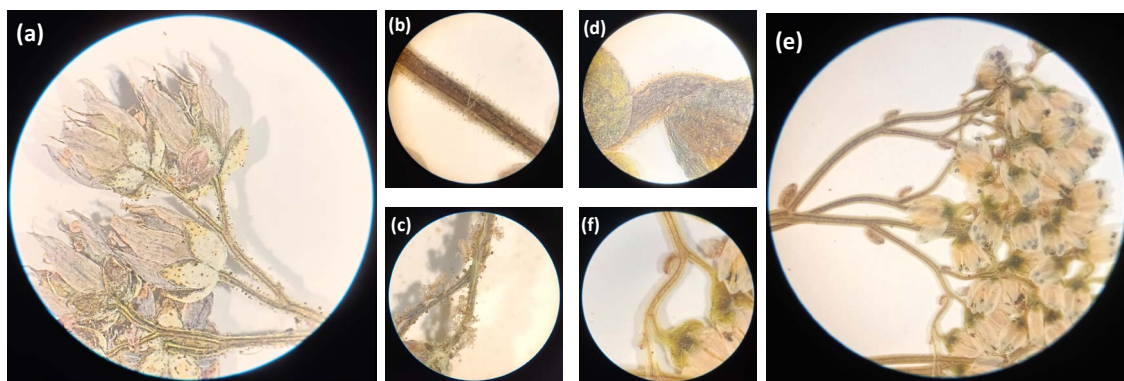


Figure 1. *Sedum dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman (LEB065542): (a) inflorescence; (b) stem; (c) flowering stem; and (d) leaves. *S. dasyphyllum* L. subsp. *dasyphyllum* (LEB025183): (e) inflorescence; and (f) flowering stem. Magnification: 25 x.

nomenclatural type (*S. dasyphyllum* L.) and two other European species: *Sedum mucizonia* (Ortega) Raym.-Hamet and *Sedum hirsutum* All.

*Sedum dasyphyllum* L. is a species of the genus *Sedum* L. (Crassulaceae) with a Eurosiberian and Mediterranean distribution, although it is now naturalized in other parts of the world (Webb, 1964). While specimens of *S. dasyphyllum* L. were not found in Linnaeus's herbarium, he described it in his work *Species Plantarum* as a "Sedum with opposite, ovate to obtuse and fleshy leaves, with a weak stem sprinkled with flowers" (t Hart & Jarvis, 1993). To this description, certain distinguishing characteristics can be added, such as the perennial nature, sessile leaves with a basal hump, obtuse sepals fused at the base, whitish petals fused at the base, violet anthers, and erect brown follicles (2–2.5 mm) (Castroviejo & Velayos, 1997; von Raab-Straube & Raus, 2021). Its chromosome number is  $2n = 28$  (t Hart, 1985). Ecologically, it is characteristic of the class *Asplenetia trichomanis* Br.-Bl. (order *Potentilletalia caulescentis* Br.-Bl.), inhabiting preferably calcareous rocky areas (Rivas-Martínez et al., 2011).

The taxonomic treatment of *Flora Iberica* (Castroviejo & Velayos, 1997) recognizes three subspecies present in the Iberian Peninsula: i) *Sedum dasyphyllum* L. subsp. *dasyphyllum*, northern distributed, glabrous or with few glanduliferous hairs on the inflorescence twigs and sepals; ii) *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman, southern distributed, with a profuse indumentum of glanduliferous hairs, and which would encompass the Balearic forms named as *S. moroderi* Pau; and iii) *S. dasyphyllum* L. subsp. *granatense* (Pau) Castrov. & Velayos, from the Betic Mountains, also with an abundant glanduliferous indumentum, but with the leaves extremely imbricate and the corolla twice the length of the calyx. *S. dasyphyllum* L. subsp. *dasyphyllum* is reported from northwestern Iberia, specifically in the provinces of Santander (Autonomous Community of Cantabria), León and Palencia. On the other hand, according to Velayos & Castroviejo (1997) *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman is only cited, without having been ratified, for the province of Palencia ("Pa"), and uncertainly for Lugo ("Lu?"). The GBIF database does not contain any record of preserved specimens or human observations of *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman in Santander, León or

Palencia (GBIF, 2024). This database shows only two records for the entire northwestern Iberian Peninsula: a citation of Anthos in the Louzara Valley (Lugo; gbif.org/occurrence/237497253) and a specimen preserved in the herbarium of the University of Alicante (ABH) and collected in Proaza; Caranga de Arriba (Asturias; gbif.org/es/occurrence/318122484). Illustrations of both taxa are depicted in Figure 1.

The primary objective of this paper is to review the preserved plant material of the species *S. dasyphyllum* L. available in the herbaria of northwestern Spain, specifically FCO, LEB and SANT herbaria, to determine the adequacy of its infraspecific assignment. This note represents the first revision of the material of the species in this region and the first records for the provinces of León, Lugo, Orense, Oviedo, Palencia and Santander.

## Material and Methods

The studied material corresponds to 56 *Sedum dasyphyllum* L. vouchers belonging to the following herbaria: 49 from the herbarium of the Faculty of Biological and Environmental Sciences of the University of León "Jaime Andrés Rodríguez", acronym LEB (herbarioleb.unileon.es/); five from the herbarium of the Department of Organisms and Systems of the University of Oviedo, acronym FCO (herbario.uniovi.es/) and two from the herbarium of the Department of Botany/Faculty of Pharmacy of the University of Santiago de Compostela, acronym SANT (usc.gal/herbario/#servizos). Their distribution by province is as follows: León (40), Palencia (7), Oviedo (4), Santander (3), Lugo (1), and Orense (1). They can be consulted through the Global Biodiversity Information Facility database (LEB: doi: 10.15468/dl.ud84h4; FCO: doi: 10.15468/dl.jmjb22; SANT: doi: 10.15468/dl.d3j627) (GBIF, 2024). *Flora Iberica* guidelines (Castroviejo & Velayos, 1997) were used to differentiate the recognized subspecies within *Sedum dasyphyllum* L.

## Results and Discussion

Figures 2 and 3 show two archetypal examples of *S. dasyphyllum* L. subsp. *dasyphyllum* (Figure 3) and *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman (Figure 4) obtained from LEB herbarium sheets (LEB065542 and LEB025183, respectively).



Figure 2. *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman.



Figure 3. *S. dasyphyllum* L. subsp. *dasyphyllum*.

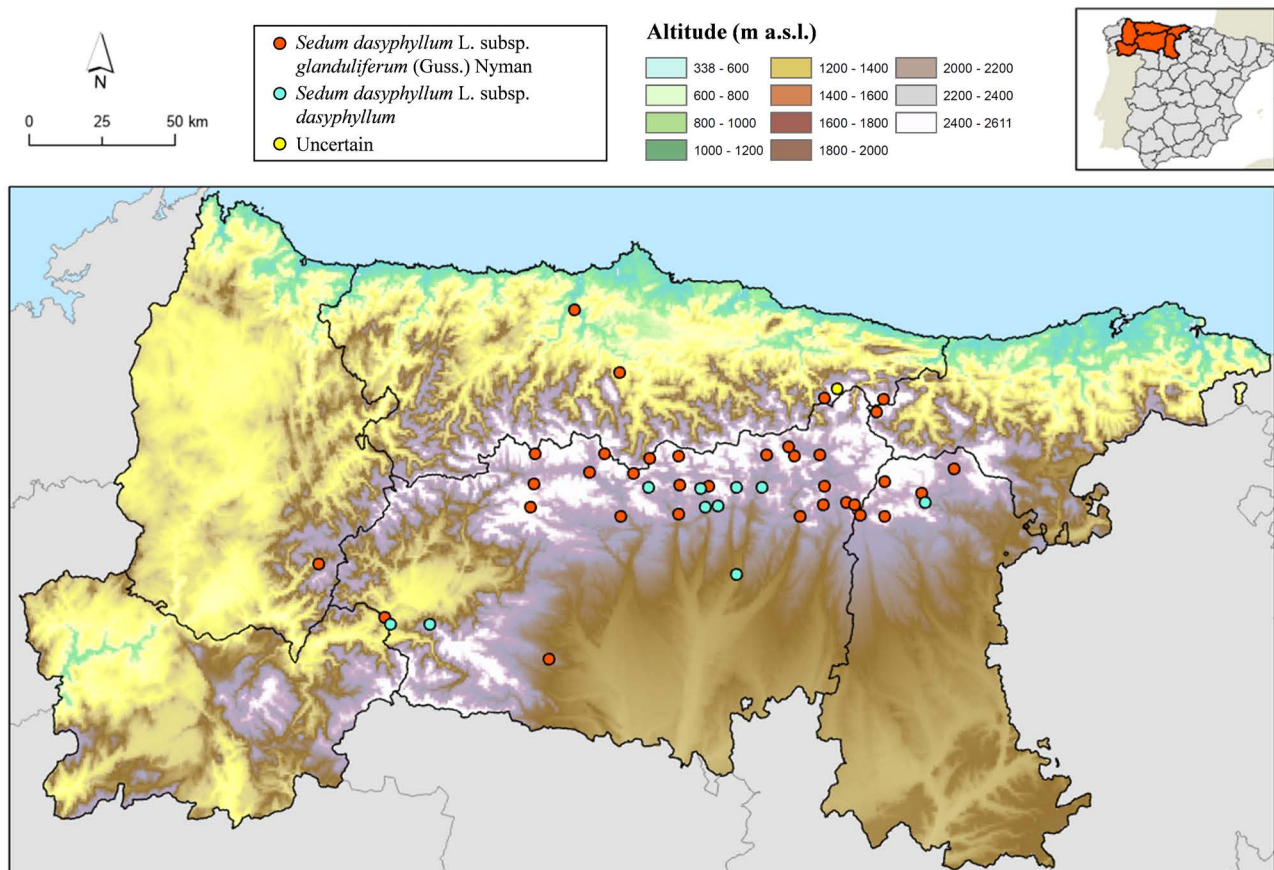


Figure 4. Distribution of *Sedum dasyphyllum* L. subsp. *dasyphyllum* and *Sedum dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman presence in the provinces of León, Lugo, Ourense, Oviedo, Palencia and Santander.

Most of the specimens (45, 83.3 %) had profuse glanduliferous indumentum (Figure 1a, b, c and d and Figure 2) and were therefore reclassified as *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman. Most of them (42) had been originally ascribed as *S. dasyphyllum* L. It should be noted, on the other hand, that the specimens that were initially ascribed as *S. dasyphyllum* L. subsp. *dasyphyllum* (7) only two species have been reattached as *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman. While some individuals had scattered glands present on the stem flora and sepals, many of those considered to be *S. dasyphyllum* L. subsp. *dasyphyllum* were completely glabrous (Figure 1e, 1f and Figure 3). Finally, it should be noted that the voucher FCO12532-1, presented fallen and very dessicated leaves despite having glands in the floral stem, so its infraspecific treatment was considered as “uncertain”.

Figure 4 illustrates the distribution of the two subspecies of *S. dasyphyllum* L. after re-identification of the specimens studied. At first glance, no clear spatial pattern is apparent. Castroviejo & Velayos (1997) considered it a latitudinally southern subspecies. In the same vein, Bolós & Vigo (1984), who considered *Sedum dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman allopatric to the type subspecies *S. dasyphyllum* L. subsp. *dasyphyllum* in the Balearic Islands and lowland areas of Valencia and Catalonia suggests that these glands may serve as protection against radiation in southern locations. This hypothesis is also supported by its

recent recorded presence in North Africa (Sakhraoui & Thomson, 2024).

Nevertheless, the presence in such northern locations found in our study could disprove its southern tendency. Furthermore, de la Torre *et al.* (1995) stated that this taxon finds its bioclimatic optimum between thermo- and supramediterranean semiarid-humid. However, its abundant presence in the Temperate macrobioclimate found in our study area, from supra- to orotemperate humid-hyperhumid, suggests a much wider bioclimatic range.

De Bolós & Vigo (1984) also interpreted this southern tendency as “southern orientations”. According to our findings, of the 44 specimens of *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman, 28 were located on predominantly southern-facing slopes and 17 on northern-facing slopes. In contrast, for *S. dasyphyllum* L. subsp. *dasyphyllum*, with seven specimens found on northern-facing slopes and three on southern-facing slopes. A chi-square test ( $\chi^2$ ) conducted with these values and one degree of freedom ( $df = (2-1) * (2-1) = 1$ ) yielded a value of 3.20, which is lower than the critical value for  $\chi = 0.05$  (3.84). Thus, statistically, the hypothesis that the studied specimens exhibit a preference for either orientation must be rejected, at least within the study area of this research.

Furthermore, there is a general consensus that *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman occupies lower elevations than *S. dasyphyllum* L. subsp. *dasyphyllum*. Castroviejo & Velayos (1997)

reported the altitudinal range of *S. dasyphyllum* L. as 0–3000 m, but did not specify the extent of range reduction for *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman. De Bolós & Vigo (1984) provided specific altitudinal limits. However, *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman was found up to 700 m asl in Catalonia and up to 600 m asl in the Valencian Community—consistent with Pérez Dacosta (2021)—and up to 1440 m asl in the Balearic Islands. In contrast, *S. dasyphyllum* L. subsp. *dasyphyllum* extended its range to 2500 m asl in Catalonia and 1800 m asl in the Valencian Community (not present in the Balearic Islands). Again, our findings do not support the notion that *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman occupies lower elevations. In fact, the slight altitudinal difference between the studied populations favors this subspecies: the mean elevation of *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman populations is 1320.9 m asl ( $\pm 355.4$  m asl), whereas for *S. dasyphyllum* L. subsp. *dasyphyllum*, it is 1221.9 m asl ( $\pm 321.3$  m asl). Within the study area, the altitudinal ranges of both subspecies are provided below, including minimum, interquartile range, and maximum values: *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman: 96 (1175.5–1534) 2036 m asl and *S. dasyphyllum* L. subsp. *dasyphyllum*: 550 (1070–1309) 1375 m asl.

Finally, it is worth discussing some observations regarding the apparent ecology of *Sedum dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman. From the limited information that can be deduced from the studied sheets, no substantial differences can be inferred with respect to the typical ecology of *S. dasyphyllum* L. subsp. *dasyphyllum*. Most of them were collected on calcareous walls, which coincides with the preferred ecology described in Flora Iberica (Castroviejo & Velayos, 2007). Some of them, especially those collected in the north-northwest of León, appear on ‘siliceous rocks’ or ‘sandstone ridges’, so it can be inferred that it also shows an indifferent edaphic behaviour. From a phytosociological point of view, it should be noted that *Sedum dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman, in addition to occurring as a characteristic species in *Asplenietalia petrarchae* Br.-Bl. (Sánchez-Gómez & Alcaraz, 1992; Pérez Raya *et al.*, 2004; Agulló *et al.*, 2010), it can also appear on nitrified rocks of the class *Parietarietea judaicae* Rivas-Martínez (Mota *et al.*, 2005; Gil *et al.*, 2018) and in calcareous meadows on skeletal soils, forming pioneer communities in xerothermophilous positions (Llorens & Gil, 2017). Therefore, it would appear associated with the habitats of community interest “8210: Calcareous rocky slopes with chasmophytic vegetation” and “6110: Calcareous karstic or basophilic calcareous meadows of the *Alyso-Sedion albi*” (Amorós Muela *et al.*, 2020). Finally, it should be noted that, to the best of our knowledge, it has not been included in any regional or transnational protection catalog, although Gil *et al.* (2018) consider that its conservation level is of little concern on the island of Mallorca.

## Conclusions

*S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman is, based on the preserved plant material analyzed, a new record for the provinces of León, Lugo, Orense, Oviedo, Palencia and Santander. Of the

56 sheets originally ascribed to *Sedum dasyphyllum* L. or *S. dasyphyllum* L. subsp. *dasyphyllum*, 45 have been re-ascribed as *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman, 1 was uncertain, 5 were re-ascribed as *S. dasyphyllum* L. subsp. *dasyphyllum* and 5 maintained their original ascription (*S. dasyphyllum* L. subsp. *dasyphyllum*). Populations of *S. dasyphyllum* L. subsp. *glanduliferum* (Guss.) Nyman does not appear to occupy more southerly latitudes or preferentially southerly orientations. On the other hand, they do seem to occur, on average, at higher altitudes in the study area analyzed.

## Acknowledgements

Authors would like to thank Barnaby E. Bouchard and Llibertat Cortés for their advice on English terminology. In turn, we extend our thanks to LEB-Jaime Andrés Rodríguez (UNILEON: herbarioleb.unileon.es/), FCO-Department of Organisms and Systems (UNIOVI: herbario.uniovi.es/) and SANT-Department of Botany (USC: usc.gal/herbario/#servizos) herbaria for the provision of the materials that have made this work possible. We extend our greatest gratitude to Francisco Javier Amigo Vázquez and to Tomás E. Díaz González for their help with SANT and FCO materials. The following institutions financially support the authors: Ministerio de Ciencia, Innovación y Universidades (FPU21/03022; GBFL), Universidad de León (AAS), CONACYT-México (NYOR) and DGAPA-UNAM (AGP).

## Authorship

GBFL.: Conceptualization, Data curation, Formal analysis, Methodology, Fundraising, Research, Software, Visualization, Writing-first draft, Writing-review and editing. RAR.: Conceptualization, Research, Methodology, Supervision, Visualization, Writing-review and editing. AÁS.: Data curation, Fundraising, Software, Visualization, Writing-review and editing. NYOR.: Data curation, Fundraising, Software, Visualization, Writing-review and editing. Á.P.: Conceptualization, Data curation, Methodology, Resources, Supervision, Visualization, Writing-review and editing. SdR.: Conceptualization, Management of the project, Resources, Supervision, Visualization, Writing-review and editing. A.G.-P.: Conceptualization, Data curation, Methodology, Fundraising, Research, Software, Supervision, Visualization, Writing-review and editing.

## Conflict of interest

None.

## References

- Agulló, J.C., Alonso, M.Á., Juan, A., Villar, J.L. & Crespo, M.B. 2010. Apreciaciones sintaxonómicas y nomenclaturales sobre las comunidades rupícolas de la asociación Jasonio glutinosae-Teucrietum thymifolii. *Lazaroa* 31: 155–163. doi: 10.5209/rev\_LAZA.2010.v31.11
- Amorós Muela, A., Prieto Cerdán, A. & Padilla Blanco, A. 2020. Análisis del patrimonio natural y cultural del pantano de Elda (Alicante, España). In: Carracedo, V., García-Codron, J.C., Garmendia, C., Rivas, V. (Eds.). *Conservación,*



- Gestión y Restauración de la Biodiversidad. XI Congreso Español y I Congreso Iberoamericano de Biogeografía. Pp. 225–234. Asociación de Geógrafos Españoles, Santander.
- Castroviejo, S. & Velayos, M. 1997. *Sedum* L. In: Castroviejo, S., Aedo, C., Laínz, M., Morales, R., Muñoz Garmendia, F., Nieto Feliner, G. & Paiva, J. (Eds.). *Flora iberica. Plantas vasculares de la Península Ibérica e Islas Baleares: Vol. V. Ebenaceae–Saxifragaceae*. Pp. 121–153. Real Jardín Botánico-CSIC, Madrid.
- de Bolós, O. & Vigo, J. 1984. *Flora dels Països Catalans, I: Licopodiàcies – Capparàcies*. Editorial Barcino, Barcelona.
- de la Torre, A., Vicedo, M. & Alonso, Á. 1995. Flora y vegetación de algunas islas de Alicante. *Ecologia Mediterranea* 21(3/4): 113–126. doi: 10.3406/ecmed.1995.1796
- Gil, L., Cardona, C. & Cerrato, M.D. 2018. La flora del terme municipal de sa Pobla (Mallorca). Distribució en quadrícules d'1x1 km. *Ajuntament de sa Pobla, sa Pobla*.
- Llorens, L. & Gil, L. 2017. The Balearic Islands. In: Loidi, J. (Ed.). *The Vegetation of the Iberian Peninsula- Volume 2*. Pp. 3–33. Springer, Cham. doi: 10.1007/978-3-319-54867-8\_1
- Messerschmid, T.F., Klein, J.T., Kadereit, G. & Kadereit, J.W. 2020. Linnaeus's folly-phylogeny, evolution and classification of *Sedum* (Crassulaceae) and Crassulaceae subfamily Sempervivoideae. *Taxon* 69(5): 892–926. doi: 10.1002/tax.12316
- Mota, J.F., Cueto, M., Pérez-García, F.J., Garrido, J.A., Martínez-Hernández, F., Medina-Cazorla, J. M., Sola, A.J. & Schwarzer, H. 2005. Contribución al conocimiento de la flora de Andalucía: citas novedosas de la provincia de Almería, el elemento estenócoro. *Acta Botánica Malacitana* 30: 227–231. doi: 10.24310/abm.v30i0.7204
- Nikulin, V.Y., Gontcharova, S.B., Stephenson, R. & Gontcharov, A.A. 2016. Phylogenetic relationships between *Sedum* L. and related genera (Crassulaceae) based on ITS rDNA sequence comparisons. *Flora* 224: 218–229. doi: 10.1016/j.flora.2016.08.003
- Pérez Dacosta, J.M. 2021. Aportaciones a la flora de la comarca del Alto Mijares (Castellón). *Flora Montiberica* 79: 68–70.
- Pérez Raya, F., Molero Mesa, J., El Aallali, A., López Nieto, J.M., Olmedo Cobo, J.A., Herrán Wiedenfeld, V. & Hita Fernández, J.A. 2004. *Sierra de Loja. Consejería de Medio Ambiente de la Junta de Andalucía*. Universidad de Granada.
- Rivas-Martínez, S. & col. 2011. Mapa de series, geoseries y geopermaseries de vegetación de España: Memoria del mapa de vegetación potencial de España. Parte II (1). *Itinera Geobotanica* 18(1): 5–424.
- Sakhraoui, N. & Thomson, G. 2024. Native and non-native succulent plants in Algeria. *Bradleya* 42: 131–149. doi: 10.25223/brad.n42.2024.a14
- Sánchez-Gomez, P. & Alcaraz, F. 1992. Novedades fitosociológicas presentes en el subsector Subético-Murciano (España). *Anales de Biología* 18: 121–152.
- † Hart, H. & Jarvis, C.E. 1993. Typification of Linnaeus's names for European species of *Sedum* subgen. *Sedum* (Crassulaceae). *Taxon* 42(2): 399–410. doi: 10.2307/1223149
- † Hart, H. 1985. Chromosome numbers in *Sedum* (Crassulaceae) from Greece. *Willdenowia* 15: 115–135.
- † Hart, H. 1991. Evolution and classification of the European *Sedum* species (Crassulaceae). *Flora Mediterranea* 1: 31–61.
- von Raab-Straube, E. & Raus, T. 2021. Euro+ Med-Checklist Notulae, 14. *Willdenowia* 51(3): 355–369. doi: 10.3372/wi.51.51304
- Webb, D.A. 1964. LXXII. Crassulaceae. In: Tutin, T.G. et al. (Eds.). *Flora Europaea: Volume 1 Lycopodiaceae to Platanaceae*. Pp. 350–364. Cambridge University Press, Cambridge.

## Websites

- GBIF. 2024. Global Biodiversity Information Facilities. Available from [www.gbif.org](http://www.gbif.org) [Accessed 02 July 2024].