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## A re-evaluated taxon: Genetic values and morphological characters support the recognition of the Canary Island juniper of the *phoenicea* group at a specific level

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### Abstract

Analyses based on cone, seed and needle characteristics revealed that *J. canariensis* Guyot in Mathou & Guyot is distinct from both the Circum-Mediterranean *J. turbinata* and West-Mediterranean *J. phoenicea*. The genetic differences between these three taxa, which make up the aggregate of *J. phoenicea*, are found also at a high level. These data support the recognition of the Canarian juniper at the specific level. A key is proposed, in which taxa of the *J. phoenicea* aggregate can be distinguished on the basis of morphological traits.

The nomenclatural name: *Juniperus phoenicea* subsp. *canariensis*, widely employed in the literature, is validly published. Besides we adduce that *Juniperus canariensis* Knight ex Godron, is not a validly published name, and therefore can not be considered an earlier homonym of *J. canariensis* Guyot in Mathou & Guyot.

**Keywords:** Cupressaceae, Canary Islands, Macaronesian Region, nomenclature, phytogeography, taxonomy

### Introduction

*Juniperus phoenicea* Linnaeus (1753: 1040) (Cupressaceae Gray, *nom. cons.*) belongs to the monophyletic genus *Juniperus* (Adams 2004, 2008, 2014; Little 2006, Mao *et al.* 2010) and monophyletic section *Sabina* Spach (1841: 291; Mao *et al.* 2010), which includes 56 species widely distributed mostly across the northern hemisphere (Farjon & Filer 2013; Ferrer-Gallego *et al.* 2017). *Juniperus phoenicea sensu lato* (*s.l.*) includes an aggregate of taxa known from the Macaronesian, Mediterranean and Saharo-Arabian floristical regions (after Takhtajan 1986). It occurs from the Sinai (Danin 1983; El-Bana *et al.* 2010) and the Western Arabian peninsulas (Browicz 1982) to the East, across the Mediterranean region, to the Canary and Madeira Archipelagos to the West (Mazur *et al.* 2016, 2018).

The large West—East geographic range of *J. phoenicea s.l.*, the complicated geological history of these regions (e.g. Sengör & Yilmaz 1981; Krijgsmann *et al.* 1999; Goes *et al.* 2004; Sciandrello *et al.* 2005; Gerbault *et al.* 2018), palaeo-climate changes (Fady *et al.* 2008; Hewitt *et al.* 2011) and complexity of the Mediterranean and Macaronesian ecological conditions (Thompson 2005; Zohary 1973; Otto *et al.* 2012), together with the ancient origin of the species (Mao *et al.* 2010) are the probable cause of its differentiation (Conord, Gurevitch & Fady 2012). One of the results of this evolutionary process was the description of several closely related taxa, which were afterwards treated as synonyms, varieties and/or subspecies of *J. phoenicea s.l.*, sometimes also as independent species.

Lebreton & Pérez de Paz (2001) distinguished five taxa: *Juniperus phoenicea* L., *J. turbinata* Guss. subsp. *turbinata* var. *orientalis* P. Lebreton & P. Pérez, *J. turbinata* subsp. *turbinata* var. *occidentalis* P. Lebreton & P. Pérez, *J. turbinata* chemiovar. *montana* P. Lebreton & P. Pérez and *J. turbinata* subsp. *canariensis* (Guyot) P. Lebreton & P. Pérez. Adams *et al.* (2002), using a different taxonomic criteria, recognised four taxa: *J. phoenicea* var. *phoenicea*, *J. phoenicea* var. *canariensis*, *J. phoenicea* subsp. *eumediterranea* P. Lebreton & Thivend and *J. phoenicea* var. *turbinata*. Farjon (2005) distinguished only two taxa, namely *J. phoenicea* subsp. *phoenicea* and *J. phoenicea* subsp. *turbinata* (Guss.) Nyman. Subsequently, Adams (2014), adopting genetic differences between them, recognised these two taxa at the species level: *J. phoenicea sensu stricto* (*s. str.*) and *J. turbinata*. Published during the last decades,

biochemical (Lebreton & Pérez de Paz 2001), molecular (Adams *et al.* 2002; Adams & Schwarzbach 2013; Adams 2008; Adams *et al.* 2013, 2014; Boratyński *et al.* 2009; Dzialuk *et al.* 2011) and morphological studies (e.g. Mazur *et al.* 2010) support the specific level of *J. phoenicea* and *J. turbinata* (Adams 2014). Finally, revisions were proposed by Adams & Schwarzbach (2013) and Mazur *et al.* (2016), where *J. phoenicea* subsp. *turbinata* has been accepted at species rank. This taxonomic position was also accepted in IUCN by the Conifer Specialist Group (see <http://www.iucnredlist.org/details/16349692/0>), which narrowed *J. phoenicea s. str.* to previous *J. phoenicea* subsp. *phoenicea* (Farjon 2015).

The Canarian specimens of the *J. phoenicea* complex were described by Guyot as *J. canariensis* Guyot in Mathou & Guyot, Trav. Lab. Forest. Toulouse Tome 1, volume 3, article 20: 7 (1942), on the basis of material from Gomera. Afterwards, Hansen & Sunding (1985, 1993) assigned them to *Juniperus phoenicea*. Subsequently, it was combined as *J. turbinata* subsp. *canariensis* (Guyot in Mathou & Guyot) Rivas Mart., Wildpret & P. Pérez (Rivas-Martínez *et al.* 1993) or as *J. phoenicea* var. *canariensis* (Guyot) Gaussen (Gaussen, 1968; Adams, Pandey, Rezzi, & Casanova, 2002). This last combination proposed for the Canarian specimens of the complex of *J. phoenicea* remains hitherto unpublished in accordance to the rules of the International Code of Nomenclature for Plants (Turland *et al.* 2018). In spite of that, the *J. turbinata* subsp. *canariensis* nomenclatural position has been adopted in the literature concerning the Canary Islands (e.g. Otto *et al.* 2010, 2012), but has not been shared by other authors (Dobignard & Chatelain 2010), who still at that time considered the Canary and Madeira plants as *J. phoenicea* subsp. *phoenicea*. In addition, the Canarian juniper has been treated as a synonym of *J. phoenicea* (Farjon 2005) or *J. turbinata* (Adams 2014).

The latest genetic studies (Jiménez *et al.* 2017; Sánchez-Gómez *et al.* 2018) detected a clear distinction of the Canarian populations when compared to the other origins of *J. phoenicea* and/or *J. turbinata*. Also, the studies on cone, seed and needle morphological characteristics indicated that the individuals representing Canarian populations differed significantly from European *J. phoenicea s. str.* and from *J. turbinata* (Mazur *et al.* 2018). Both types of differences, the genetic (Jiménez *et al.* 2017: 6, Fig 2a; Sánchez-Gómez *et al.* 2018: 7–8, Figs 2 and 3) and morphological (Mazur *et al.* 2018: 8, Figs 2.1 and 2) indicated that the Canarian juniper deserves a separate taxonomic status, similar to the status of *J. turbinata*.

## Results

On revising the bibliography, we came across evidence that *J. canariensis* has been used by different authors. The pioneer to use this name *Juniperus canariensis* was Knight (1850) in the Syn. Conif. 13. There it was mentioned, but not described (*nomen nudum*, Art. 38.2).

Later in the book of George Gordon (1858, Pinetum:114), the taxon *Juniperus canariensis* Knight ex Gordon, was mentioned but it was not validly published, because it was merely cited as a synonym (Turland *et al.* 2018: Article 31.1b).

This juniper is mentioned also as a synonym of *Juniperus webbii* by Carrière (1855). Later the same author (Gordon 1880) in the new edition of Pinetum placed *Juniperus canariensis* Knight ex Gordon within the synonymy of *Juniperus cedrus* Webb & Berthel. 1836–1850: 277. Since *Juniperus canariensis* Knight ex Gordon is not validly published it can not be considered an earlier homonym (Turland *et al.* 2018: Art 53.1) for the Canarian juniper plants of the aggregate *phoenicea*.

Following the International Plant Nomenclature code, the Canary Island plants cannot therefore go under the name *J. canariensis* Knight ex Gordon, and for this reason we propose to restore the Canarian plants to specific status, under the name *Juniperus canariensis*, published by Mathou & Guyot (1942).

***Juniperus canariensis*** Guyot in Mathou & Guyot Trav. Lab. Forest. Toulouse, Tome 1, volume 3, article 20: 7–8 (1942).

*J. canariensis* Knight, Syn. Conif.: 13 (1850) (*nomen nudum*)

*J. canariensis* Knight ex Gordon, Pinetum: 114. (1858).

Type in Herbario Monspensulano (MPU): “*In montis culminae Teneriffæ ad reclinatorium Britanicorum*, Bouchet, 1982”

Despite this, a lectotype was designated later by Farjon (2005: 337): E. Bourgeau, *Plantae Canariensis* n° 439/ *Juniperus phoenicea* Linn.

/ *ins.* Gomera: Barranco de Hermigua / April 1846. Kew (K)000075180 (image available at: <https://plants.jstor.org/stable/10.5555/al.ap.specimen.k000075180/>).

Some considerations concerning the names *Juniperus canariensis* Guyot in Mathou & Guyot has received.

In the bibliography we have often found the indication *Juniperus canariensis* Guyot in Mathou & Guyot and also *Juniperus canariensis* Guyot & Mathou sensu Farjon 2005: 337. In accordance with Article 33.1 of the International Code of Botanical Nomenclature (Turland *et al.* 2018) when the various conditions for valid publication are not simultaneously fulfilled, the date is that on which the last is fulfilled. The first publication of Guyot (1942) does not fulfill these requirements and for this reason it is not valid. Only the proposal of the name is valid. With the second publication of this taxon (Mathou & Guyot 1942) we find the latin diagnosis and the designation of the type specimen.

Also it has been referred to as:

*J. turbinata* subsp. *canariensis* (Guyot in Mathou & Guyot) Rivas Mart., Wildpret & P. Pérez, Itinera Geobot. 7: 511 (1993).

*J. turbinata* subsp. *canariensis* (Guyot in Mathou & Guyot) Lebreton & P. Pérez, Bull. Mens. Soc. Linn. Lyon 70(4): 81 (2001).

*J. phoenicea* L. var. *canariensis* (Guyot in Mathou & Guyot) Gaussen, Trav. Lab. Forest. Toulouse. Tome II, volume I, Partie II (2), Fascicule X, Chapitre XIII: 145 (1968) invalid combination.

*J. phoenicea* L. subsp. *canariensis* sensu Hüppe *et al.* 1996, Phytocoenologia 26: 417 invalid combination.

*J. phoenicea* L. subsp. *canariensis* sensu Adams *et al.* 2009, Phytologia 91: 41 (2009) invalid combination.

The name *J. phoenicea* subsp. *canariensis* had already been used (Hüppe *et al.* 1996; Adams *et al.* 2009, 2010; Otto *et al.* 2010, 2012; Jiménez *et al.* 2017) but, rather, to refute the claim that the Canary plants merited a separate status within the *J. phoenicea* complex. The name used by the aforementioned authors does not constitute a validly published combination, since they neither made a formal proposal nor provided the basionym, which invalidates the proposal according to article 41.5 of the International Code of Botanical Nomenclature (Turland *et al.* 2018). To close this account of proposed but non-valid nomenclatural combinations, the same applies to *J. phoenicea* var. *canariensis* published by Gaussen (1968), which lacks validity since the synonym goes unmentioned.

In addition, since the name *J. phoenicea* subsp. *canariensis* has been widely used in the literature (Hüppe *et al.* 1996; Adams *et al.* 2009, 2010; Otto *et al.* 2010, 2012; Jiménez *et al.* 2017) but has been not proposed as a valid combination, we hereby make it effective, without this being detrimental to the specific level treatment that should be applied to the Canary Island plants.

*J. phoenicea* L. subsp. *canariensis* (Guyot in Mathou & Guyot) Romo, Mazur, Salvà-Catarineu & Borat. **comb. nova**

Basionym: *J. canariensis* Guyot in Mathou & Guyot Trav. Lab. Forest. Toulouse, Tome 1, volume 3, article 20: 7–8 (1942).

### Key to the taxa recognized inside the *J. phoenicea* aggregate.

1. Male inflorescence ripening at end of winter and early spring, seed cone ±globose or rarely somewhat ellipsoidal, to 10 mm long ..... *J. phoenicea*
- Male inflorescence ripening in autumn, seed cone ellipsoidal (turbinate), long ±10 mm or more ..... 2
2. Seed cones with more than 3 seeds, branchlet bark reddish ..... *J. turbinata*
- Seed cones with 3 or less seeds, branchlet bark brown ..... *J. canariensis*

### Discussion

Summarizing, the differences between *J. phoenicea* s. str., *J. turbinata* and *J. canariensis* presented in Table 1 justify in our opinion, the equivalent taxonomic status of these three taxa.

*Juniperus phoenicea* ≡ *J. phoenicea* subsp. *phoenicea* was considered to be widely distributed throughout the Mediterranean Region (Farjon 2005; Adams 2008). It is only recently that this taxon's presence has been restricted to the Eastern Iberian Peninsula, south of France and NW Italy (Conti *et al.* 2005; Mazur *et al.* 2018; Bartolucci *et al.* 2018). Its assignment by some authors to the Maghreb countries: Morocco, Algeria and Tunisia (Dobignard & Chatelain 2010) does not adjust to reality, neither does it seem very likely to be present in the Greek flora (Dimopoulos *et al.* 2013). The presence of this taxon in Greek flora is not accepted later in the supplement of the checklist published by Dimopoulos *et al.* (2016).

Our results differ from Farjon & File (2014) who state that *J. phoenicea sensu stricto* is present across the whole Mediterranean Basin.

*Juniperus turbinata* colonizes the whole Mediterranean, more frequently occurring in the western part of the region (Mazur *et al.* 2018).

*Juniperus canariensis*, on the other hand, is restricted to the Canary Islands (Mazur *et al.* 2018) and probably also to the Madeiran archipelago (Adams *et al.* 2009, 2010).

**TABLE 1.** Morphological differences between *Juniperus canariensis*, *J. phoenicea* and *J. turbinata*

| Characteristics                     | <i>J. canariensis</i>           | <i>J. phoenicea</i>   | <i>J. turbinata</i>       |
|-------------------------------------|---------------------------------|-----------------------|---------------------------|
| Seed cones                          | spherical (8)9–12(14) mm long   | spherical 5–9 mm long | elongate 7–11(14) mm long |
| Number of seeds in cone             | < 3                             | 7–9 (13)              | 4–7(10)                   |
| Pollen shed                         | X–XI                            | II–III                | X–XI                      |
| Branchlets bark                     | grey to brown                   | grey to brown         | reddish                   |
| Macroblasts adult leaves separation | <2 mm                           | 2 mm                  | 2–4 mm                    |
| Brachyblasts                        | lax                             | lax                   | dense                     |
| Leaves on woody branches            | obtuse                          | obtuse to subacutes   | acute to long-acuminate   |
| Branches                            | slightly caudate                | caudate               | caudate                   |
| Geographic distribution             | Canary and Madeira Archipelagos | West-Mediterranean    | Circum-Mediterranean      |

## References

- Adams, R.P. (2004) *Junipers of the World: the genus Juniperus*. Trafford Publishing Co., Vancouver, Canada. 275 pp.
- Adams, R.P. (2008) *Junipers of the world: the genus Juniperus*, 2th ed. Trafford Publishing Co., Vancouver, Canada. 402 pp.
- Adams, R.P. (2014) *Junipers of the world: the genus Juniperus*, 4th ed. Trafford Publishing, Victoria. 422 pp.
- Adams, R.P., Altarejos, J., Arista, M. & Schwarzbach, A.E. (2014) Geographic variation in *Junieprus phoenicea* var. *phoenicea* from throughout its range: analysis of nrDNA and the petN-PsbM cp region. *Phytologia* 96: 247–251.
- Adams, R.P., Boratyński, A., Arista, M., Schwarzbach, A.E., Leschner, H., Liber, Z., Minissale, P., Mataraci, T. & Manolis, A. (2013) Analysis of *Juniperus phoenicea* from throughout its range in the Mediterranean using DNA sequence data from nrDNA and petN-psbM: the case for the recognition of *J. turbinata* Guss. *Phytologia* 95: 202–209.
- Adams, R.P., Padney, N., Rezzi, S. & Casanova, J. (2002) Geographic variation in the random amplified polymorphic DNAs (RAPDs) of *Juniperus phoenicea*, *J. p.* var. *canariensis*, *J. p.* subsp. *eumediterranea* and *J. p.* var. *turbinata*. *Biochemichal Systematics and Ecology* 30 (3): 223–229.  
[https://doi.org/10.1016/S0305-1978\(01\)00083-7](https://doi.org/10.1016/S0305-1978(01)00083-7)
- Adams, R.P., Rumeu, B., Nogales, M. & Fontinha, S. (2009) Geographic variation and systematics of *Juniperus phoenicea* L. from Madeira and the Canary islands: analyses of leaf volatile oils. *Phytologia* 91: 40–53.
- Adams, R.P., Rumeu, B., Nogales, M. & Fontinha, S. (2010) Geographic variation and systematics of *Juniperus phoenicea* L. from Madeira and the Canary islands: SNPS FROM nrDNA and petN-psbM. *Phytologia* 92: 59–67.
- Adams, R.P. & Schwarzbach, A.E. (2013) Phylogeny of *Juniperus* using nrDNA and four cpDNA regions. *Phytologia* 95: 179–187.
- Bartolucci, F., Peruzzi, L., Galasso, G., Albano, A., Alessandrini, A., Ardenghi, N.M.G., Astuti, G., Bacchetta, G., Ballelli, S., Banfi, E., Barberis, G., Bernardo, L., Bouvet, D., Bovio, M., Cecchi, L., Di Pietro, R., Domina, G., Fascetti, S., Fenu, G., Festi, F., Foggi, B., Gallo, L., Gottschlich, G., Gubellini, L., Iamonico, D., Iberite, M., Jiménez-Mejías, P., Lattanzi, E., Marchetti, D., Martinetto, E., Masin, R.R., Medagli, P., Passalacqua, N.G., Peccenini, S., Pennesi, R., Pierini, B., Poldini, L., Prosser, F., Raimondo, F.M., Roma-Marzio, F., Rosati, L., Santangelo, A., Scoppola, A., Scortegagna, S. Selvaggi, A., Selvi, F., Soldano, A., Stinca, A., Wagensommer, R.P., Wilhelm, T. & Conti, F. (2018) An updated checklist of the vascular flora native to Italy. *Plant Biosystems* 152: 179–303.  
<https://doi.org/10.1080/11263504.2017.1419996>
- Boratyński, A., Lewandowski, A., Boratyńska, K., Montserrat, J.M. & Romo, A. (2009) High level of genetic differentiation of *Juniperus phoenicea* (Cupressaceae) in the Mediterranean region: geographic implications. *Plant Systematics and Evolution* 277 (3): 163–



- Browicz, K. (1982) *Chorology of trees and shrubs in the South-West Asia and adjacent Regions*. Volume 1. Polish Scientific Publishers, Warszawa-Poznań. 172 pp.
- Carrière, E.A. (1855) *Traité général des conifères*. Paris. 656 pp.
- Conord, C., Gurevitch, J. & Fady, B. (2012) Large scale longitudinal gradients of genetic diversity: a meta-analysis across six phyla in the Mediterranean basin. *Ecology and Evolution* 2: 2600–2614.  
<https://doi.org/10.1002/ece3.350>
- Conti, F., Abbate, G., Alessandrini, A. & Blasi, C. (Eds.) (2005) *An Annotated Checklist of the Italian Vascular Flora*. Palombi e Partner A r.l. Editori, Roma. 420 pp.
- Danin, A. (1983) *Desert vegetation of Israel and Sinai*. Cana Publishing House, Jerusalem. 148 pp.
- Dimopoulos, P., Raus, Th, Bergmeier, E., Constantinidis, Th., Iatrou, G., Kokkini, S., Strid, A. & Tzanoudakis, D. (2013) Vascular plants of Greece: An annotated checklist. *Englera* 31: 1–372.
- Dimopoulos, P., Raus, Th., Bergmeier, E., Constantinidis, Th., Iatrou, G., Kokkini, S., Strid, A. & Tzanoudakis, D. (2016) Vascular plants of Greece: An annotated checklist. Supplement. *Willdenowia* 46 (3) : 301–347.  
<https://doi.org/10.3372/wi.46.46303>
- Dobignard, A. & Chatelain, C. (2010) *Index synonymique de la Flore de l’Afrique du Nord*. Volume 1. Éditions de Conservatoire et Jardin Botaniques de Genève, Genève. 455 pp.
- El-Bana, M., Shaltout, K., Khalafallah, A. & Mosallam, H. (2010) Ecological status of the Mediterranean *Juniperus phoenicea* L. relicts in the desert mountains of North Sinai, Egypt. *Flora* 205: 171–178.  
<https://doi.org/10.1016/j.flora.2009.04.004>
- Dzialuk, A., Mazur, M., Boratyńska, K., Montserrat, J.M., Romo, A. & Boratyński, A. (2011) Population genetic structure of *Juniperus phoenicea* (Cupressaceae) in the western Mediterranean Basin: gradient of diversity on a broad geographical scale. *Annals of Forest Science* 68 (8): 1341–1350.  
<https://doi.org/10.1007/s13595-011-0150-7>
- Fady, B., Lefèvre, F., Vendramin, G.G. & Ambert, A. (2008) Genetic consequences of past climate and human impact on eastern Mediterranean *Cedrus libani* forests. Implications for their conservation. *Conservation Genetics* 9: 85–95.  
<https://doi.org/10.1007/s10592-007-9310-6>
- Farjon, A. (2005) *A monograph of Cupressaceae and Sciadopitys*. Royal Botanic Gardens, Kew, London. 648 pp.
- Farjon, A. (2015) *Juniperus turbinata*. The IUCN Red List of Threatened Species 2015. Available from: <http://www.iucnredlist.org/details/16349692/0> (accessed 11 July 2016)
- Farjon, A. & Filer, D. (2013) *An Atlas of the World’s Conifers. An Analysis of their Distribution, Biogeography, Diversity and Conservation Status*. Brill Academic Publishers, Leiden, The Netherlands. 512 pp.  
<https://doi.org/10.1163/9789004211810>
- Ferrer-Gallego, P., Nazzaro, R., Ferrando-Pardo, I. & Laguna, E. (2017) Typification of the Mediterranean endemic conifer *Juniperus turbinata* (Cupressaceae). *Phytotaxa* 302 (2): 165–173.  
<https://doi.org/10.11646/phytotaxa.302.2.6>
- Gaussen, H.M. (1968) Les Gymnospermes actuelles et fossiles. Fascicule X, Les Cupressacées. Toulouse Faculté des Sciences. *Travaux du Laboratoire Forestier de Toulouse*. Tome II, Volume I, Partie II (2), Fascicule X, Chapitre XIII: 1–326.
- Gerbault, M., Schneider, J., Reverso-Peila, A. & Corsini, M. (2018) Crustal exhumation during ongoing compression in the Variscan Maures-Tanneron Massif, France—Geological and thermo-mechanical aspects. *Tectonophysics* 746: 439–458.  
<https://doi.org/10.1016/j.tecto.2016.12.019>
- Goes, S., Giardini, D., Jennya, S., Hollenstein, C., Kahleb, H.G. & Geiger, A. (2004) A recent tectonic reorganization in the south-central Mediterranean. *Earth and Planetary Science Letters* 226: 335–345.  
<https://doi.org/10.1016/j.epsl.2004.07.038>
- Gordon, G. (1858) *The Pinetum: being a synopsis of all the coniferous plants at present known, with description, history and synonymes*. London: Henry G Bohn, York street, Convent Garden. 353 + XII pp.  
<https://doi.org/10.5962/bhl.title.15649>
- Gordon, G. (1880) *The Pinetum: being a synopsis of all the coniferous plants at present known, with description, history and synonymes and a comprehensive systematic index*. London: Henry G Bohn, York street, Covent Garden 484 + XXIV pp.  
<https://doi.org/10.5962/bhl.title.45036>
- Guyot, A.P. (1942) *Contribution à l’étude de Juniperus phoenicea Lin*. Thèses Pharmacie. Toulouse, Number 93, 1 vol, 73 pages, 17 figures + 1 map.
- Hansen, A. & Sunding, P. (1985) Flora of Macaronesia. Checklist of Vascular Plants, 3rd revised Edition. *Sommerfeltia* 1: 1–167.

- Hansen, A. & Sunding, P. (1993) Flora of Macaronesia. Checklist of Vascular Plants, 4rd revised Edition. *Sommerfeltia* 17: 1–295.
- Hewitt, N., Klenk, N., Smith, A.L., Bazely, D.R., Yan, N., Wood, S., MacLellan, J.I., Lipsig-Mumme, C. & Henriques, I. (2011) Taking stock of the assisted migration debate. *Biological Conservation* 144: 2560–2572.  
<https://doi.org/10.1016/j.biocon.2011.04.031>
- Hüppe, J., Pott, R. & Wilpret de la Torre, W. (1996) Standortliche Differenzierungen im subtropischen Sukkulentenbusch der Kanareninsel Teneriffa. *Phytocoenologia* 26 (4): 417–444.  
<https://doi.org/10.1127/phyto/26/1996/417>
- Jiménez, J.F., Sánchez-Gómez, P., Cánovas, J.L., Hensen, I. & Aouissat, M. (2017) Influence of natural habitat fragmentation on the genetic structure of Canarian populations of *Juniperus turbinata*. *Silva Fennica* 51, number 2 article id 1678. 14 p.  
<https://doi.org/10.14214/sf.1678>
- Knight, J. (1850) *A Synopsis of the coniferous plants grown in Great Britain, and sold by Knight and Perry, at the Exotic nursery, King's Road, Chelsea*. London.
- Krijggsman, W., Hilgen, F.J., Raffi, I., Sierro, F.J. & Wilson, D.S. (1999) Chronology and progression of the Messinian salinity crisis. *Nature* 400: 652–655.  
<https://doi.org/10.1038/23231>
- Lebreton, P. & Pérez de Paz, P.L. (2001) Définition du Genévrier de Phénicie (*Juniperus aggr. phoenicea*), reconsidéré à ses limites biogéographiques: Méditerranée orientale (Crète et Chypre) et Atlantique (Iles Canaries). *Bulletin mensuel de la Société Linnéenne de Lyon* 70 (4): 73–92.  
<https://doi.org/10.3406/linly.2001.11373>
- Linnaeus, C. (1753) *Species plantarum*, 2 vols. Impensis Laurentii Salvii, Holmiae [Stockholm], 1200 pp.
- Little, D.P. (2006) Evolution and circumscription of the true Cypresses (Cupressaceae: *Cupressus*). *Systematic Botany* 31: 461–480.  
<https://doi.org/10.1600/036364406778388638>
- Mao, K., Hao, G., Liu, J., Adams, R.P. & Milne, R.I. (2010) Diversification and biogeography of *Juniperus* (Cupressaceae): variable diversification rates and multiple intercontinental dispersals. *New Phytologist* 188: 254–272.  
<https://doi.org/10.1111/j.1469-8137.2010.03351.x>
- Mathou, Th. & Guyot, A.P. (1942) Le genévrier des îles Canaries: *Juniperus canariensis* Guyot. *Travaux du Laboratoire Forestier de Toulouse*, tome1 (fascicule 3) article 20: 1–8.
- Mazur, M., Zielińska, M., Boratyńska, K., Romo, A., Salvà-Catarineu, M., Marcysiak, K. & Boratyński, A. (2018) Taxonomic and geographic differentiation of *Juniperus phoenicea* agg. based on cone, seed, and needle characteristics, *Systematics and Biodiversity* 16: 469–483.  
<https://doi.org/10.1080/14772000.2018.1439120>
- Mazur, M., Klajbor, K., Kielich, M., Sowiniska, M., Romo, A., Montserrat, J.M. & Boratyński, A. (2010) Intra-specific differentiation of *Juniperus phoenicea* in the western Mediterranean region revealed in morphological multivariate analysis. *Dendrobiology* 63: 21–31.
- Mazur, M., Minissale, P., Sciandrello, S. & Boratyński, A. (2016) Morphological and ecological comparison of populations of *Juniperus turbinata* Guss. and *J. phoenicea* L. from the Mediterranean region. *Plant Biosystems* 150 (2): 313–322.  
<https://doi.org/10.1080/11263504.2014.994579>
- Otto, R., Barone, R., Delgado, J.D., Arévalo, J.R., Garzón-Machado, V., Cabrera-Rodríguez, F. & Fernández-Palacios, J.M. (2012) Diversity and distribution of the last remnants of endemic juniper woodlands on Tenerife, Canary Islands. *Biodiversity and Conservation* 21: 1811–1834.  
<https://doi.org/10.1007/s10531-012-0278-2>
- Otto, R., Krüsi, B.O., Delgado, J.D., Fernández-Palacios, J.M., García-Del-Rey, E. & Arévalo, J.R. (2010) Regeneration niche of the Canarian juniper: the role of adults, shrubs and environmental conditions. *Annals of Forest Science* 67 (7): 709.  
<https://doi.org/10.1051/forest/2010034>
- Rivas-Martínez, S., Wildpret, W. & Pérez de Paz, P.L. (1993) Datos sobre *Juniperus phoenicea* ggr. (Cupressaceae). *Itinera Geobotanica* 7: 509–512.
- Sánchez-Gómez, P., Jiménez, J.F., Cánovas, J.L., Vera, J.B., Hensen, I. & Aouissat, M. (2018) Genetic structure and phylogeography of *Juniperus phoenicea* complex throughout Mediterranean and Macaronesian regions: different stories in one. *Annals of Forest Science* 75:75.  
<https://doi.org/10.1007/s13595-018-0741-7>
- Sciandrello, S., Guarino, R., Minissale, P. & Spampinato, G. (2015) The endemic vascular flora of Peloritani Mountains (NE Sicily): Plant functional traits and phylogeographical relationships in the most isolated and fragmentary micro-plate of the Alpine orogeny. *Plant Biosystems* 149 (5): 838–854.  
<https://doi.org/10.1080/11263504.2014.908978>

- Sengör, A.M.C. & Yilmaz, Y. (1981) Tethyan evolution of Turkey: a plate tectonic approach. *Tectonophysics* 75: 181–241.  
[https://doi.org/10.1016/0040-1951\(81\)90275-4](https://doi.org/10.1016/0040-1951(81)90275-4)
- Spach, E. (1841) Révision des *Juniperus*. *Annales des Sciences Naturelles, Botanique*, sér. 2, 16: 282–305. Available from: <http://www.biodiversitylibrary.org/item/111687#page/310/mode/1up> (accessed 1 March 2018)
- Takhtajan, A. (1986) *Floristic Regions of the World*. University of California Press, Berkeley. 522 pp.
- Thompson, J.D. (2005) *Plant evolution in the Mediterranean*. Oxford University Press, Oxford. 293 pp.
- Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.-H., Li, D.-Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F. (Eds.) (2018) *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017*. Regnum Vegetabile 159. Glashütten: Koeltz Botanical Books.  
<https://doi.org/10.12705/Code.2018>
- Webb, P.B. & Berthelot, S. (1836–1850) *Histoire Naturelle des Îles Canaries*, Tome troisième. Deuxième partie. Phytographia canariensis. Sectio III. Bureaux: Rue Pavée-Saint-André-des-Arts, 17. Paris. 479 pp + 115 tables.
- Zohary, M. (1973) *Geobotanical foundations of the Middle East*. 2 volumes. Gustav Fisher Verlag, Stuttgart. 739 pp.