

Typification of *Celastrus senegalensis* and *C. europaeus* (Celastraceae, Celastroideae)

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Abstract

The nomenclatural types of *Celastrus senegalensis* Lam., basionym of the current name *Maytenus senegalensis* (Lam.) Exell, and *C. europaeus* Boiss., basionym of *M. senegalensis* subsp. *europaea* (Boiss.) Rivas Martínez ex Güemes & M.B. Crespo (Celastraceae, Celastroideae), are discussed. A specimen preserved in the herbarium P, at the Museum national d'Histoire naturelle of Paris, is treated in this work as the neotype of *M. senegalensis*, and a specimen kept in the herbarium G, at the Conservatoire et Jardin botaniques of Genève, is designated as the lectotype of *M. senegalensis* subsp. *europaea*.

Keywords

Gymnosporia, *Maytenus*, Boissier, Lamarck, lectotype, neotype, nomenclature.

Resumen

Tipificación de *Celastrus senegalensis* y *C. europaeus* (Celastraceae, Celastroideae).

Se discuten los tipos nomenclaturales de *Celastrus senegalensis* Lam., basónimo de *Maytenus senegalensis* (Lam.) Exell, y *C. europaeus* Boiss., basónimo de *M. senegalensis* subsp. *europaea* (Boiss.) Rivas Martínez ex Güemes & M.B. Crespo (Celastraceae, Celastroideae). Un espécimen conservado en el herbario P, en el Museo Nacional de Historia Natural de París, es considerado en este trabajo como el neotipo de *M. senegalensis*, y un espécimen conservado en el herbario G, en el Conservatorio y Jardín Botánico de Ginebra, se designa como lectotipo de *M. senegalensis* subsp. *europaea*.

Palabras clave

Gymnosporia, *Maytenus*, Boissier, Lamarck, lectotipo, neotipo, nomenclatura.

Introduction

Celastraceae Robert Brown contains approximately 98 genera and 1264 species distributed worldwide. They are found in the tropics and subtropics, with some rare representatives in temperate regions (Loesener, 1942; Simmons *et al.*, 2001a, 2001b; Simmons, 2004). The genus *Maytenus* Molina (1782: 177) has traditionally been

treated as a large genus of about 300 species that is widely distributed in tropics and subtropics of both the Old and New Worlds (McKenna *et al.*, 2011; Biral *et al.*, 2017).

Maytenus senegalensis (Lam.) Exell subsp. *senegalensis* [\equiv *Celastrus senegalensis* Lam.; *Gymnosporia senegalensis* (Lam.) Loes.] is an intricately branched, very spiny, evergreen shrub 1–2 m, with leaves ovate-oblong to obovate-rhombic,

entire, long-cuneate at base, somewhat glaucous, capsule 5–7 mm wide, globose, 2-locular or 1-locular through abortion; seeds reddish-brown, shiny. This subspecies is distributed in tropical Asia and Africa (López González, 2001; Ruiz de la Torre, 2006).

From the taxonomic and nomenclatural point of view, several authors consider *M. senegalensis* subsp. *europaea* (Boiss.) Rivas Martínez ex Güemes & M.B. Crespo within the morphological variability of *M. senegalensis* (see Tutin, 1968; Greuter *et al.*, 1984; Bolòs & Vigo, 1989; López González, 2001; Pérez-Latorre *et al.*, 2010; Mendoza-Fernández *et al.*, 2019 and 2020 -*ut G. senegalensis*-). However, several modern taxonomic treatments accept this taxon as independent and adapted to arid Mediterranean climate, with subspecific rank (see Güemes & Crespo, 1990; Benedí, 1997; Díez-Garretas *et al.*, 2005; Ruiz de la Torre, 2006; Blanca *et al.*, 2009; Mateo *et al.*, 2013; Mateo & Crespo, 2014; Raab-Straube, 2018), distributed throughout North Africa (Morocco and Algeria) and the South of Spain (along the coastal areas from Malaga to Alicante provinces) (see Esteve Chueca, 1955 -*ut Gymnosporia europaea*-; Güemes & Crespo, 1990; Benedí, 1997; Pérez García *et al.*, 2003; Pérez Latorre *et al.*, 2004; Ruiz de la Torre, 2006; Raab-Straube, 2018; Manzano Cano, 2020).

Likewise, *M. senegalensis* subsp. *europaea* communities are unique vegetal formations in Europe, and they are considered Priority Habitat by Directive 92/43/EEC (see Mendoza-Fernández *et al.*, 2015), showing relevant ecological and phenomorphological adaptations (Pérez Latorre *et al.*, 2010) and being considered as an extremely threatened habitat (Mendoza-Fernández *et al.*, 2015, 2019, 2020). In addition, this taxon is included in several Spanish Red Lists of vascular flora and Nature Protection Acts (Hernández Bermejo & Clemente, 1994; Blanca *et al.*, 2000; Sánchez Gómez *et al.*, 2002; Cabezudo *et al.*, 2005; Blanca *et al.*, 2009).

The well-documented ethnobotanical use of the *Maytenus* genus is very extensive (Niero *et al.*, 2011; Veloso *et al.*, 2017). Concretely, *M. senegalensis* s.l. is an important medical plant in Africa. It is used to treat respiratory ailments and inflammations (da Silva *et al.*, 2011; Makgatho *et al.*, 2018).

The types of the names *M. senegalensis* and *M. senegalensis* subsp. *europaea* are examined closely. The purpose of this paper is to contribute to the stability of the nomenclature. The designation of the types is based on the consultation of the original material and the literature cited in the respective protologues.

Results and discussion

Maytenus senegalensis

Lamarck's protologue (1785: 661) of *Celastrus senegalensis*, numbered "6" in the *Encyclopédie Méthodique* [Celastré du Sénégal], consists of a morphological description in Latin: "Celastrus spinis foliosis, ramis teretibus, foliis ovato-oblongis inaequaliter dentatis, cymis minimis paucifloris. N. [Nobis]", followed by a complete description of this species in French. Furthermore, Lamarck (1785) added "Cet arbrisseau est cultivé au Jardin du Roi : on le dit originaire du Sénégal, & provenu de graines envoyées ou rapportées par M. Adanson (v.v.) Nous ne l'avons pas encore vu en fruit" [This shrub is cultivated in the King's Garden (i.e., "Jardin des plantes de Paris" or Gardens of the Plants): it is said to be native to Senegal, and it comes from seeds sent or reported by Mr. Adanson (v. v.) We have not yet seen it in fruit]. Accordingly, it seems that Lamarck did not use herbarium specimens to describe this species, and it was only based on a plant that grew in the Botanical Garden of Paris "Jardin du Roi". The indication in the protologue as "(v. v.)" must be treated as the acronym of "vidi vivam" (i.e., seen alive). In addition, Lamarck included the indication "Hort. Reg." [Hortus Regius] in the protologue after the binomial *Celastrus senegalensis*.

The nomenclatural type of *Maytenus senegalensis* was cited by Robson *et al.* (1994: 17) as: "Type: a cultivated plant in the Jardin du Roi, Paris, seed from Senegal (P-LA, holo)". I have located a relevant specimen of *Celastrus senegalensis* in the Lamarck herbarium at P, with 2-D code P00295391. This specimen (three stems) is very well-preserved and complete, with leaves and flowers, but no fruit (Fig. 1). The sheet bears two labels: 1) "Celastrus Senegalensis. j." handwritten by Lamarck; and 2) "53. Cel. senegalensis Lam.", and a third printed label, annotated as: "Herbier de Lamarck".

At the end of the 18th century and during the elaboration of the *Encyclopédie*, Lamarck worked as conservator of the herbarium of the *Jardin du Roi*, from 1782 to 1788, before the change to the *Muséum national d'histoire Naturelle* in 1793. This allowed Lamarck to describe new taxa in his "*Encyclopédie méthodique. Botanique*" (Stafleu & Cowan, 1979; Ibáñez *et al.*, 2009). However, although the specimen at P mentioned by Robson *et al.* (1994) seems to be the only element on which Lamarck's description is based, Lamarck included in the protologue a relevant annotation "(v. v.)" (i.e., *vidi vivam*) [and not (v. s.) (i.e., *vidi sicco*; or from a herbarium sheet)]. In addition, unfortunately, there is no clear evidence that this material at P was used by Lamarck to describe his species, although the sheet

bears a label handwritten by the author, because it could have been mounted after publication of the protologue.

On the other hand, a specimen annotated by Lamarck at P is not necessarily original material for the name, particularly since the most specimens that are connected to Lamarck used for describe the species in the *Encyclopédie* are labelled “dict.” [dictionnaire in French; “dictionary”]. In addition, the mere fact that the specimen is annotated as type is no proof that it is type material by modern standards. As at most older herbaria, there are also many specimens in P labelled as types or placed in type folders, which are not.

In conclusion, we consider the P specimen as the ideal candidate for neotype. Therefore, as the specimen at P cannot undoubtedly be treated as the holotype, the Robson’s use of the term “holotype” is corrected to neotype according to Art. 9.10 of the *Shenzhen Code* (Turland *et al.* 2018). Fortunately, this specimen matches well with Lamarck’s description of *M. senegalensis*, and unambiguously with the traditional concept and current use of the name (e.g., Bolòs & Vigo, 1989; Güemes & Crespo, 1990; Benedí, 1997; López González, 2001; Ruiz de la Torre, 2006).

Maytenus senegalensis (Lam.) Exell in Bol. Soc. Brot., ser. 2, 26: 223. 1952
≡ *Celastrus senegalensis* Lam., Encycl. 1 : 661. 1785

≡ *Gymnosporia senegalensis* (Lam.) Loes. in Bot. Jahrb. Syst. 17: 541. 1893

Neotype (designated by Robson *et al.*, 1994: 17 as “holotype” and corrected here according to Art. 9.10 of the *ICN*): [France, Paris] “cultivé au Jardin du Roi : on le dit originaire du Sénégal, & proven de grains envoyées ou rapportées par M. Adanson” [see Lamarck (1785: 661)]”, s.d., *Lamarck s.n.*, (P [2-D code P00295391]) (Fig. 1).

Maytenus senegalensis* subsp. *europaea

The protologue of *Celastrus europaeus* (Boissier, 1838: 29) included a description in Latin followed by a comment “Nomine deceptus credidi *Cel. multiflorum* Lam., qui *Cel. hispanici* nomine in *H. Par. colitur* meam plantam esse, sed ex autopsiâ vidi meam omninó diversam esse, foliis magis elongates obtusiús laxiúsque dentatis et praecipuè capsulis plus quadruplò minoribus nec trilocularibus”, and the provenance: Type: “Legi in tractu montano inter *Almunecar* et *Nerja* inter frutices vix 1000’ suprâ mare, fine aprilis jam fructiferum”. Later, this species was treated in the genus *Catha* (see Boissier 1845: 725), as *C. europaea* (Boiss.) Boiss.

Burdet *et al.* (1983: 440) mentioned “Nous n’avons trouvé dans les herbiers de Genève aucun

échantillon de ce taxon, correspondant au protologue” [we have not found in the herbaria of Geneva any specimen of this taxon, corresponding to the protologue]. In this sense, in 1983 the specimen was on loan cf. the round stamp on the right of Sebsebe’s determinavit: “7883 / 22” meaning loan number 78 of the year 83, 22nd sheet. Güemes & Crespo (1990: 86) published a new combination and a new rank, but no comment was provided on the nomenclatural type.

Figure. 1. Neotype of *Celastrus senegalensis* Lam. (≡ *Maytenus senegalensis* (Lam.) Exell), P (2-D code P00295391). Image by courtesy of the herbarium P, reproduced with permission.

Figura. 1. Neotipo de *Celastrus senegalensis* Lam. (≡ *Maytenus senegalensis* (Lam.) Exell), P (2-D código P00295391). Imagen por cortésia del herbario P, reproducida con permiso.

In the herbarium of the Conservatoire et Jardin botaniques de Genève at G, there is a specimen of this plant, with barcode G00301523, that bears two stems (a stem with only a leaf, and the other one with leaves and fruits) and an envelope with fragments of stems, leaves and fruits. The sheet

199

contains also an original label, annotated as “*Celastrus* / *Europaeus* [handwritten by Boissier] / TAB. 38 / *Velilla*. / *Canion in montim* / *inter Almunecar et Nerjam* / 24 aprili [handwritten probably by Reuter]”, and a second label with 1984 Sebsebe’s handwritten determination indicating “HOLOTYPE of *Celastrus europaeus* Boiss.” (Fig. 2).

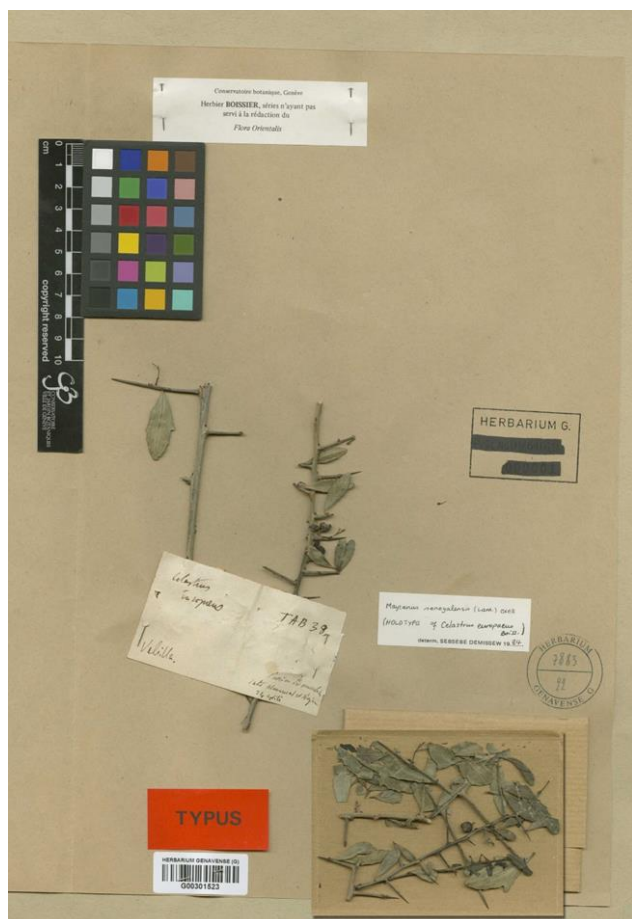


Figure. 2. Lectotype of *Celastrus europaeus* Boiss. (≡ *Maytenus senegalensis* subsp. *europaea* (Boiss.) Rivas Martínez ex Güemes & M.B. Crespo), G (G00301523). Image by courtesy of the herbarium G, reproduced with permission.

Figura. 2. Lectotipo de *Celastrus europaeus* Boiss. (≡ *Maytenus senegalensis* subsp. *europaea* (Boiss.) Rivas Martínez ex Güemes & M.B. Crespo), G (G00301523). Imagen por cortesía del herbario G, reproducida con permiso.

This specimen can be treated undoubtedly as original material of *Celastrus europaeus*, it match with the protologue (morphologically, and also the locality and date of collection). We have not found any further Boissier’s original material for this name in any herbaria consulted (e.g., BM, JE, K, MPU, P, VTA).

We consider the specimen barcoded G00301523 as the lectotype of the name *Celastrus europaeus*.

This specimen matches with the traditional and current use of the name (e.g., see Güemes & Crespo, 1990; Benedí, 1997; Díez-Garretas *et al.*, 2005; Ruiz de la Torre, 2006; Blanca *et al.*, 2009; Mateo *et al.*, 2013; Mateo & Crespo, 2014; Raab-Straube, 2018).

Maytenus senegalensis* subsp. *europaea (Boiss.) Rivas Martínez ex Güemes & M.B. Crespo in *Anales Jard. Bot. Madrid* 48 : 86. 1990

≡ *Celastrus europaeus* Boissier, *Elench. Pl. Nov.* : 29. 1838

≡ *Catha europaea* (Boiss.) Boissier, *Voy. Bot. Espagne* 2: 725. 1845

≡ *Gymnosporia europaea* (Boiss.) Masf., *Anales Soc. Esp. Hist. Nat.* 10: 176. 1881

≡ *Gymnosporia senegalensis* var. *europaea* (Boiss.) Jahand. & Maire, *Cat. Pl. Maroc* 2: 474. 1932

Lectotype (designated here): Spain, Granada-Málaga, “*Almunecar et Nerja* inter frutices vix 1000’ supra mare”, 24 April, *Boissier s.n.* (G [G00301523]!) (Fig. 2).

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References

- Blanca, G., Cabezudo, B., Cueto, M., Fernández López C. & Morales Torres, C. (Eds.) (2009). *Flora Vascular de Andalucía Oriental*. Sevilla: Junta de Andalucía.
- Blanca, G., Cabezudo, B., Hernández-Bermejo, J.E., Herrera, C.M., Muñoz, J. & Valdés, B. (2000). *Libro Rojo de la flora silvestre amenazada de Andalucía. Especies vulnerables*. Sevilla: Junta de Andalucía.
- Benedí, C. (1997). *Maytenus* Molina. In S. Castroviejo, C. Aedo, C. Benedí, M. Laínz, F. Muñoz Garmendia, G. Nieto Feliner & J. Paiva (Eds.) *Flora iberica*, vol. 8 (pp. 179–181). Madrid: Real Jardín Botánico, CSIC.
- Biral, L., Simmons, M.P., Smidt, E.C., Tembrock, L.R., Bolson, M., Archer, R.H. & Lombardi, J.A. (2017). Systematics of New World *Maytenus* (Celastraceae) and a new delimitation of the genus. *Systematic Botany*, 42, 680–693.
- Boissier, E. (1838). *Elenchus plantarum novarum*. Genève: Lador et Ramboz.
- Boissier, E. (1839–1845). *Voyage botanique dans le midi de l’Espagne pendant l’année 1837*. Paris: Gide et Cie., Libraires-éditeurs.
- Bolòs, O. de & Vigo J. (1989). *Flora dels Països Catalans*, vol. 2. Barcelona: Ed. Barcino.

- Burdet, H.M., Charpin, A. & Jacquemoud, F. (1983). Types nomenclaturaux des taxa ibériques décrits par Boissier ou Reuter. III. Aceracées à Chénopodiacees. *Candollea*, 38, 401–441.
- Cabezudo, B., Talavera, S., Blanca, G., Salazar, C., Cueto, M., Valdés, B., Hernández, J.E., Herrera, C.M., Rodríguez, C. & Navas, D. (2005). *Lista Roja de la Flora Vasculare de Andalucía*. Sevilla: Consejería de Medio Ambiente de la Junta de Andalucía.
- da Silva, G., Serrano, R. & Silva, O. (2011). *Maytenus heterophylla* and *Maytenus senegalensis*, two traditional herbal medicines. *Journal of Natural Science, Biology and Medicine* 2, 59–65.
- Díez-Garretas, B., Asensi, A. & Rivas-Martínez, S. (2005). Las comunidades de *Maytenus senegalensis* subsp. *europaeus* (Celastraceae) en la Península Ibérica. *Lazaroa*, 26, 83–92.
- Esteve Chueca, F. (1955). Descripción de comunidades con *Gymnosporia europaea* Webb y *Periploca laevigata* Ait. En el semiárido de la costa de Murcia. *Anales del Jardín Botánico de Madrid*, 12(2), 265–291.
- Greuter, W., Burdet, H.M. & Long, G. (Eds.) (1984). *Med-Checklist*, vol. 1. Gèneve: Conservatoire et Jardin botaniques; Berlin: Botanischer Garten & Botanisches Museum Berlin-Dahlem.
- Güemes, J. & Crespo, M.B. (1990). *Maytenus senegalensis* (Lam.) Exell subsp. *europaeus* (Boiss.) Rivas-Martínez, comb. nov. (Celastraceae), y noticias diversas acerca del mismo. *Anales del Jardín Botánico de Madrid*, 48, 86–88.
- Hernández Bermejo, J.E. & Clemente, M. (Eds.) (1994). *Protección de la flora de Andalucía. Catálogo general de especies de recomendada protección en Andalucía (Endémicas, Raras y Amenazadas de extinción)*. Sevilla: Junta de Andalucía.
- Ibáñez, N., Montserrat, J.M. & Soriano, I. (2009). Typification of the names of some Iberian species described by Lamarck. *Candollea*, 64, 143–148
- Lamarck, J.B. (1785). *Encyclopédie méthodique. Botanique*. Vol. 1. Paris: Panckoucke.
- Loesener, T. (1942). Celastraceae. In Engler, A., Harms, H. & Mattfeld, J. (Eds) *Die natürlichen Pflanzenfamilien*, 2 ed. (pp. 87–197). Berlin: Duncker & Humblot.
- López González, G. (2001). *Los árboles y arbustos de la Península Ibérica e Islas Baleares*. Tomo I & II. Madrid: Ed. Mundi-Prensa.
- Makgatho, M.E., Nxumalo, W. & Raphoko, L.A. (2018). Anti-mycobacterial, -oxidative, -proliferative and -inflammatory activities of dichloromethane leaf extracts of *Gymnosporia senegalensis* (Lam.) Loes. *South African Journal of Botany*, 114, 217–222.
- Manzano Cano, J. (2020). *Maytenus senegalensis* (Lam.) Exell en la Península Ibérica: distribución, ecología, fitosociología y conservación. *Acta Botanica Malacitana*, 45. <https://doi.org/10.24310/abm.v45i0.6777>
- Mateo, G. & Crespo, M.B. (2014). *Claves Ilustradas para la Flora Valenciana*. Jaca: Monografías de Flora Montiberica 6. Jaca: Jolube Consultor y Editor Botánico.
- Mateo, G., Crespo, M.B. & Laguna, E. (2013). *Flora valentina*, vol. 2. Valencia: Fundación de la Comunidad Valenciana para el Medio Ambiente.
- McKenna, M.J., Simmons, M.P., Bacon, C.D. & Lombardi, J.A. (2011). Delimitation of the segregate genera of *Maytenus* sensu lato (Celastraceae) based on morphological and molecular characters. *Systematic Botany*, 36, 922–932.
- Mendoza-Fernández, A.J., Martínez-Hernández, F., Pérez-García, F.J., Garrido-Becerra, J.A., Benito, B.M., Salmerón-Sánchez, A., Guirado, J., Merlo, M.E. & Mota, J.F. (2015). Extreme habitat loss in a Mediterranean habitat: *Maytenus senegalensis* subsp. *europaea*. *Plant Biosystems*, 149: 503–511.
- Mendoza-Fernández, Salmerón-Sánchez, A., A.J., Martínez-Hernández, F., Pérez-García, F.J., Lahora, A., Merlo, M.E. & Mota, J.F. (2019). Intensive habitat loss in south Spain: Arborescent scrubs with *Ziziphus* (5220*). In Mussarella, C.M., Cano Ortiz, A. & Quinto Casas, R. (Eds.), *Habitats of the World – Biodiversity and Threats*. IntechOpen. Retrieved 11 May 2020 from <http://dx.doi.org/10.5772/intechopen.85286>
- Mendoza-Fernández, A.J., Martínez-Hernández, F., Salmerón-Sánchez, A., Pérez-García, F.J., Teruel, B., Merlo, E. & Mota, J. (2020). The relict ecosystem of *Gymnosporia senegalensis* (Lam.) Loes. In an agricultural plastic sea: past, present and future scenarios. *BioRxiv* preprint, retrieved 11 May 2020. <https://doi.org/10.1101/2020.04.16.044651>
- Molina, J.I. (1782). *Saggio sulla Storia Naturale del Chili*. Bologna: Nella Stamperia de S. Tommaso d'Aquino.
- Niero, R., de Andrade, S.F. & Cechinel Filho, V. (2011). A Review of the Ethnopharmacology, Phytochemistry and Pharmacology of Plants of the *Maytenus* Genus. *Current Pharmaceutical Design*, 17, 1851–1871.
- Pérez García, F.J., Cueto, M., Jiménez, M.L., Garrido, J., Martínez, F., Medina, J.M., Rodríguez-Tamayo, M.L., Sola A. & Mota, J.M. (2003). Contribución al conocimiento de la flora de Andalucía: citas novedosas e interesantes de la provincia de Almería. *Acta Botanica Malacitana*, 28, 23–260.

- Pérez Latorre, A.V., Navas, D., Gavira, O., Caballero, G. & Cabezudo, B. (2004). Vegetación del Parque Natural de las sierras Tejeda, Almijara y Alhama (Málaga-Granada) España. *Acta Botanica Malacitana*, 29, 117–191.
- Pérez Latorre, A.V., Gavira, O. & Cabezudo, B. (2010). Phenomorphology and ecomorphological characters of *Maytenus senegalensis* L. shrublands in the Iberian Peninsula: A comparison with other Mediterranean plant communities. *Flora*, 205, 200–210.
- Raab-Straube, E. von (2018) Celastraceae. In: Euro+Med Plantbase - the information resource for Euro-Mediterranean plant diversity. Available at <https://www.emplantbase.org/home.html> [15/12/2019].
- Robson, N.K.B., Halle, N., Mathew, B. & Blakelock, R. (1994). Celastraceae. In R.M. Polhill (Ed.), *Flora of Tropical East Africa prepared at the Royal Botanic Gardens/Kew with assistance from the East African Herbarium* (pp. 1–78). Rotterdam: A. A. Balkema.
- Ruiz de la Torre, J. (2006). *Flora Mayor*. Madrid: Organismo Autónomo de Parques Nacionales, Dirección General para la Biodiversidad.
- Sánchez-Gómez, P., Carrión Vilches, M.A., Hernández González, A. & Guerra Montes, J. (2002). *Libro rojo de la flora silvestre protegida de la Región de Murcia*. Murcia: Dirección General del Medio Natural.
- Simmons, M.P., Clevinger, C.C., Savolainen, V., Archer, R.H., Mathews, S. & Doyle, J.J. (2001a). Phylogeny of the Celastraceae inferred from 26S nuclear ribosomal DNA, phytochrome B, *rbcl*, *atpB*, and morphology. *Molecular Phylogenetics and Evolution*, 19, 353–366.
- Simmons, M.P., Savolainen, V., Clevinger, C.C., Archer, R.H. & Davis, J.I. (2001b). Phylogeny of the Celastraceae inferred from phytochrome B gene sequence and morphology. *American Journal of Botany*, 88, 313–325.
- Simmons, M.P. (2004). Celastraceae. In K. Kubitzki (Eds.), *The families and genera of vascular plants*, 6 (pp. 29–64). Berlin: Springer Verlag.
- Stafleu, F.A. & Cowan, R.S. (1979). Taxonomic Literature. Volume II: H-Le. *Regnum Vegetabile*, 98.
- 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>
- Tutin, T.G. (1968). *Maytenus*. In Tutin, T.G., Heywood, V.H., Burges, N.A., Valentine, D.H., Walters, S.M. & Webb, D.A. (Eds.), *Flora Europaea*, vol. 2 (pp. 242). Cambridge: Cambridge University Press.
- Veloso, C.C., Soares, G.L., Perez, A.C., Rodrigues, V.G. & Silva, F.C. (2017). Pharmacological potential of *Maytenus* species and isolated constituents, especially tingenone, for treatment of painful inflammatory diseases. *Revista Brasileira de Farmacognosia*, 27, 533–540.