









## NOMENCLATURE

Nomenclature and typification of *Phoenix senegalensis* (Arecaceae)

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**Abstract** The nomenclature of the Canary Island endemic palm with red-bluish fruits is reviewed. *Phoenix senegalensis* is neotypified; *P. canariensis* var. *porphyrococca* is lectotypified. “*Fulchironia senegalensis*” is a nomen nudum; *P. menieri* is a nomen superfluum.

**Keywords** Canary Islands date palm; horticulture; nomenclature

## INTRODUCTION

Species of the iconic palm genus *Phoenix* L. (Arecaceae) are distributed, wild or cultivated (outside or indoors), from Norway (Zona, 2008) to New Zealand (Esler, 1988) and from Hawaii (Macneil & Hemmes, 1977) to Honshu and other islands of southeastern Japan (Yamashita & Takasu, 2010). Individuals and groves of *Phoenix* are frequent around the Mediterranean, and in tropical Africa, West Asia, India and Southeast Asia (Barrow, 1998; GBIF, 2018).

*Phoenix canariensis* H.Wildpret is endemic to the Canary Islands (Obón & al., 2018), and during the last century and a half has become the most important ornamental palm species both indoor and in gardens all over the world (Zona, 2008; Rivera & al., 2013a; Martínez-Rico, 2017). This has likely contributed to the position of *P. canariensis* as the second-most published on *Phoenix* species in the botanical and horticultural literature indexed in BHL (2018).

The typification and main nomenclatural issues concerning *P. canariensis* were recently addressed (Rivera & al., 2013a,b), leading to the conservation of *P. canariensis* H.Wildpret against *P. cycadifolia* Regel (Applequist, 2014; ICN, Appendix IV, <https://naturalhistory2.si.edu/botany/codes-proposals/>). However, Rivera & al. (2013a,b) did not

include *P. senegalensis* André in their study, and *P. senegalensis* falls within the morphological variation of *P. canariensis*. Naturally occurring variation (molecular and morphological) within *P. canariensis* (Saro, 2015; Carreño, 2017; Sosa & al., 2018) is reflected in horticultural variants with differences in leaf and fruit shape, as well as colour (Martínez-Rico, 2017) (Fig. 1). Not surprisingly, given its widespread ornamental use, morphological variation within the species has been classified in different ways and received names at the level of variety, species and even genus.

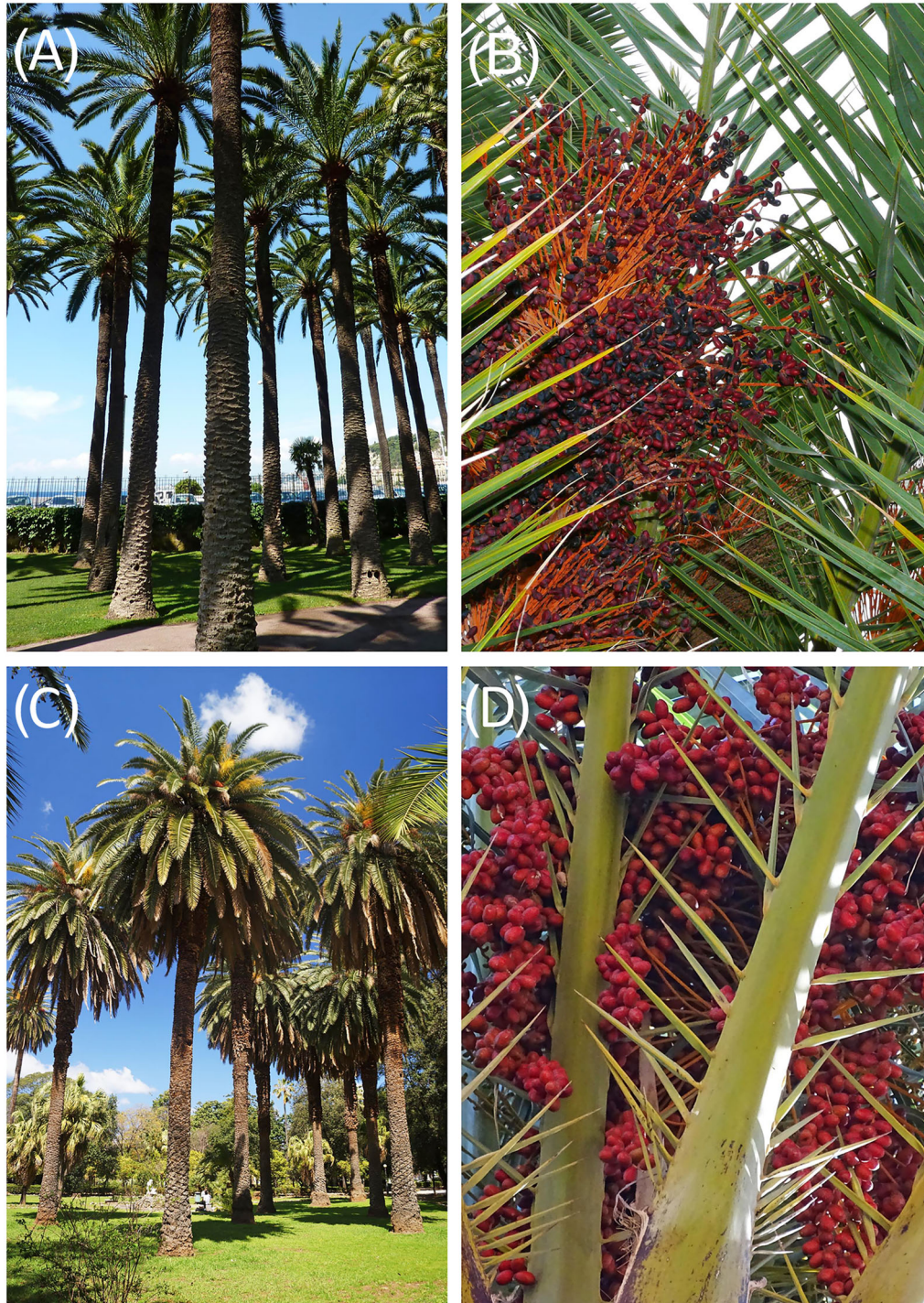
*Phoenix* date palms that are morphologically similar to typical *P. canariensis*, and differ in having red fruits that become red-bluish when ripe, have been reported in botanical and horticultural literature since at least 1885 (André, 1892; Bailey, 1919). Living specimens of these that are notable because of their age, dimensions and peculiar red-bluish fruit colour are still found in historical gardens of the Canary Islands, the French Côte d’Azur, the Spanish Levant, the Portuguese Sintra region (Nardy, 1901), the Italian Riviera, the *Reggia* of Caserta (Italy) and in botanic gardens of Lisbon (Portugal), Nice (France), Palermo and Rome (Italy) (Fig. 1).

All *Phoenix* species are dioecious, and the characters of fruits and seeds are used to differentiate some of them, so male individuals are generally more difficult to identify than female

individuals (Barrow, 1998; Rivera & al., 2014b; Torres & al., 2018). Remarkably, only female individuals of the palm with red-bluish fruits have been described. Males of this palm are so far unknown (Laguna & al., 2012; Rivera & al., 2014a). Seedlings of this variant from the Canary Islands and the Levant (Spain), the Riviera, Caserta, Palermo and Rome (Italy),

Lisbon (Portugal), and the Côte d’Azur (France) are grown in the *Phoenix* National Collection of Spain at Orihuela, and it will soon be possible to study both adult male and female specimens (INIA, 2018; Phoenix-Spain, 2018).

Nonetheless, the taxonomic status and original provenance of this unusual palm have long been unclear, and there



**Fig. 1.** A, *Phoenix canariensis* typical, Parc Vigier, Nice (July 2011); B, *Phoenix canariensis* with red and bluish fruits, Botanical Garden Nice (July 2009); C, *Phoenix canariensis* with red and bluish fruits, Villa Giulia, Palermo (April 2015); D, *Phoenix canariensis* with red and bluish fruits, Avenida de la Universidad, San Cristóbal de La Laguna (November 2017). — Photos by: C. Obón (A, B) & D. Rivera (C, D).



has been considerable discussion as to whether it is a distinct species, a variety of *Phoenix canariensis* (Carvalho-e-Vasconcellos & Amaral-Franco, 1948; Barrow, 1998; Laguna & al., 2012; ABEPYC, 2018), a variety of another *Phoenix* species such as *P. sylvestris* (L.) Roxb. or *P. reclinata* Jacq., or an interspecific hybrid (Barrow, 1998; Chabaud, 1912a,b, 1915). Based on analyses of morphology and genomic repetitive regions known as microsatellites or simple sequence repeat (SSR) markers, Rivera & al. (2014a) concluded that these palms, which have been referred to as “*Phoenix senegalensis*” or “*Fulchironia senegalensis*”, fall within the variability of *P. canariensis*.

While it may now be clear these plants belong to *Phoenix canariensis*, different names continue to be applied to them. Individuals are offered by nurseries and kept in collections under names such as “Palmier des Canaries à fruits rouges” and “*P. canariensis* ‘Porphyrocarpa’” (Palmiers, 2017; Palmaris, 2018) or “*Phoenix porphyrocarpa*” (Terre, 2018). Moreover, although these palms are considered conspecific with *P. canariensis*, the name *P. senegalensis* is often treated as a synonym of *P. reclinata* (Guillot-Ortiz, 2009; Pacsoa, 2013; UniProt, 2018). Likewise, Barrow (1998) and the African Plant Database (CJB, 2014) considered “*Fulchironia senegalensis* Lesch.” to also be a synonym of *P. reclinata*. Here we aim to resolve the nomenclatural confusion surrounding the names for this palm.

## MATERIALS AND METHODS

Specimens deposited in the following herbaria were examined: FI-B (Odoardo Beccari), FI-W (Webb), MA, NICE, ORT, P and TLON. Since some of the names were originally published in horticultural catalogues that are not widely available, several horticultural and botanical libraries were also consulted: Royal Botanic Gardens, Kew; National Botanic Garden of Belgium & Royal Botanical Society of Belgium; RHS Lindley Library; Botanischer Garten und Botanisches Museum, Berlin; Conservatoire et Jardin botaniques, Geneva.

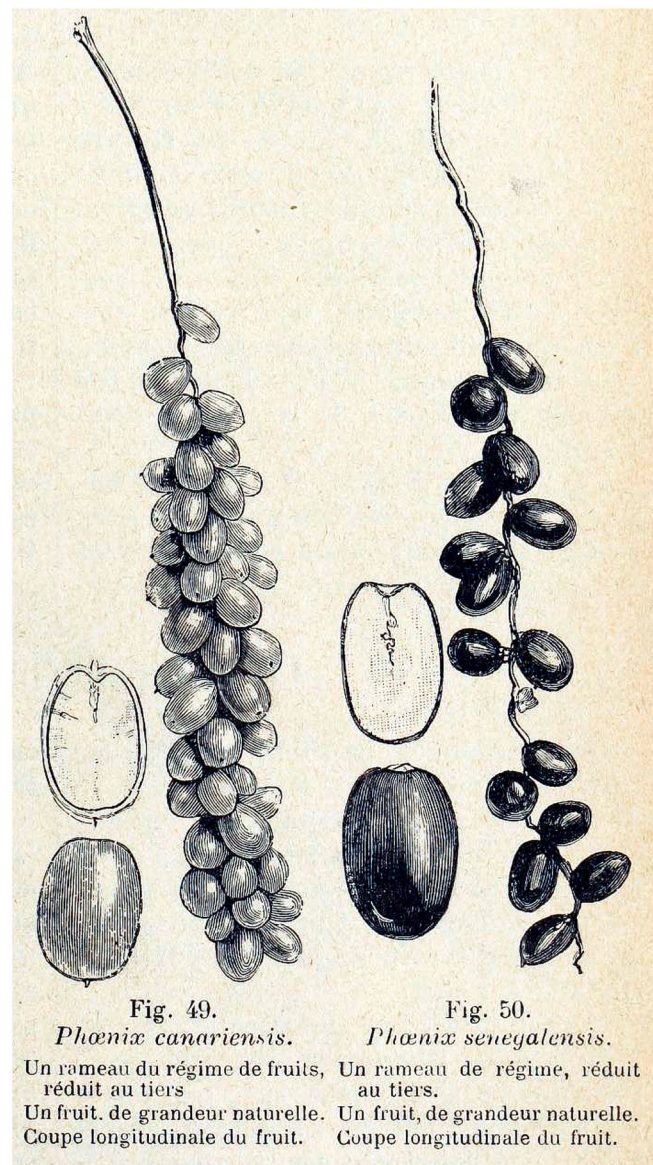
## ANALYSES AND TYPIFICATIONS

### *Phoenix senegalensis*: Valid publication and synonymy.

— The Botanical Garden of the University of Lisbon (Portugal) is located in the district of Príncipe Real. In that garden, there is an individual of *Phoenix* with red-bluish fruits, which was planted in 1873 or shortly thereafter between several individuals of morphologically typical *P. canariensis*. Jules Alexandre Daveau (1852–1929), director of the garden between 1876 and 1892, showed this “superb specimen of palm tree” to Edouard André (1890, and referred to it using the name *P. sylvestris* (André, 1892; Tavares, 1967).

Later André (1892, 1893) identified the tree with what was then called “*Phoenix senegalensis*” by gardeners in the South

of France (e.g., nurseries Brunel in Golfe-Juan and the garden of M. Koechlin, in Antibes) and validly published the name at the rank of species. Although the epithet “senegalensis” was applied to date palms well before 1892 (see below), André (1892) was the first to validly publish it even though he attributed the name to Jean Baptiste Leschenault. This attribution implicitly referred to “*Fulchironia senegalensis* Lesch. ex Desf.”, which is a nomen nudum, since it does not appear Leschenault ever published the name, and André (1892) clearly stated that he considered “*Fulchironia*” a synonym of *Phoenix*. Although the name *P. senegalensis* was validated in 1892, one year later an illustration was published by André (1893) as an accompaniment to the description of fruits in the species (Fig. 2). In that work, the fruits were compared with those of *P. dactylifera* and *P. canariensis*.



**Fig. 2.** Illustration of *Phoenix senegalensis* (André, 1893). Figure 50 represents *P. senegalensis*; fig. 49, representing *P. canariensis*, is displayed with the purpose of comparison.

Edouard André (1840–1911) was a French landscape architect and botanist (Deveikiene & Deveikis, 2015) who botanically explored Andean regions of South America in 1875 and 1876, from where he described numerous new species (André, 1889). His original herbarium and types are at K (Stafleu & Cowan, 1976). However, according to the Kew Herbarium Catalogue (Kew, 2018) these specimens are from his travels to South America, not Europe, and no *Phoenix* specimens are among the material. We tried to locate original material of *P. senegalensis* without success in other herbaria such as P (Muséum national d'Histoire naturelle), MARS (Aix Marseille Université) and MPU (Montpellier Université) where specimens collected in France by André were likely to be found.

Since no original material of *P. senegalensis* is known to be extant, and it is known which tree André studied, the most logical specimen to serve as type would be a collection made from that tree. However, such a collection does not exist, and when we obtained permission to climb the tree to get a specimen, it was so badly damaged that ascent would have been unsafe. The tree was still alive in 2009 (Fig. 3) but was subsequently affected by *Rhynchophorus ferrugineus* and died by 2016. It is worth noting that André described *P. senegalensis* not only from the tree in Lisbon but also others cultivated on the Côte d'Azur.

It is evident that *P. senegalensis* falls within the variability of *P. canariensis*, but is clearly distinct from the type of the species (Rivera & al., 2014a). Recent exploration has shown the presence of individuals with the characteristics of *P. senegalensis* on the islands of La Gomera, Gran Canaria and Tenerife (Canary Islands). In the Camino Largo of San Cristóbal de la Laguna (Tenerife Island) there are at least three of these palms with glaucous leaves and red-bluish dates, among over 200 typical *P. canariensis*. These were seemingly imported from the nursery La Quinta in Granada, owned by Pedro Giraud (Salomone & García, 2016). It is from these individuals that we collected a specimen proposed here as a neotype for *P. senegalensis* (Figs. 1D, 4).

André (1892) distinguished *P. senegalensis* from *P. canariensis* based on the glaucous leaves of the former. At the same time, he distinguished *P. senegalensis* from *P. sylvestris* based on the red-bluish fruits in *P. senegalensis*. Later, in his discussion of *P. senegalensis*, André highlighted the intermediate position of *P. senegalensis* between *P. dactylifera* and *P. canariensis*, suggesting a hybrid origin for the taxon. Sauvaigo (1894) accepted *P. senegalensis* which, for him, was similar to *P. canariensis* but with glaucous leaves and red-bluish fruits. When he commented on its cultivation in the Brunel gardens of Golfe-Juan in France, he also noted it was as a hardy palm. Sauvaigo (1894) mentioned that Odoardo Beccari considered *P. senegalensis* to be a hybrid of *P. canariensis* and *P. sylvestris*. Nardy (1901) also accepted *P. senegalensis*, with glaucous leaves and red-bluish fruits, that was grown in the Monserrate park of Sintra in Portugal, however, he questioned whether the plant could be *P. sylvestris*.

Although André (1892) accepted the species that he described, he attributed an African origin to it and thought that it was closely related, if not identical, to *P. spinosa* Thonn. Evidently, at the time of its valid publication, *P. senegalensis* was not regarded as distinct by many botanists. Indeed, André (1892) noted that Charles Naudin (1815–1899) was the only botanist at the time who retained *P. senegalensis* as distinct from *P. spinosa* (see Naudin, 1893). Subsequently, *P. spinosa* has come to be treated as a synonym of *P. reclinata* (Thiselton-Dyer, 1902; Bailey, 1919; Barrow, 1998), and *P. reclinata* is morphologically unrelated to *P. canariensis* (notably differing from that taxon in having clustering stems to 20 cm in diam. and leaves to 3.5 m long instead of solitary stems to 120 cm in diam. and leaves to 6 m long). Thus, by extension, *P. reclinata* is also unrelated to *P. senegalensis* as described by André (Barrow, 1998; Rivera & al., 2014a).

Nearly 60 years after the publication of *P. senegalensis* by André, Carvalho-e-Vasconcellos & Amaral-Franco (1948) collected from the same individual tree that had been studied by André and used their collection to describe *P. canariensis* var. *porphyrococca* Vasc. & Franco. Carvalho-e-Vasconcellos & Amaral-Franco (1948) formally described the date palm with red-bluish fruits as a variety of *P. canariensis* because at that time there was no valid and legitimate name available at an infraspecific rank. In the protologue, the type was indicated as “Palma Horto Botanico Olissiponense”. The herbaria and types of both Amaral-Franco and Carvalho-e-Vasconcellos are at LISI (Menezes, 2007; Figueiredo & al., 2018). We searched LISI for original material. Unfortunately, no specimens usable for lectotypification are known to be extant, and thus the fruit illustration published in the protologue is the only original material (Fig. 5). Therefore, the illustration is here designated as the lectotype.

*Phoenix canariensis* H.Wildpret in Prov. Agric. Hort. Ill. 2: 293–295. Oct 1882 – Lectotype (designated by Rivera & al. in Taxon 62: 1275. 2013): [illustration in] Prov. Agric. Hort. Ill. 2: fig. 67. Oct 1882.

= *Phoenix senegalensis* Lesch. ex André in Rev. Hort. (Paris) 64: 563. 1892 – **Neotype (designated here)**: [Spain, Canary Islands] Insul. Tenerife, Camino Largo de la Laguna, 19 Dec 2017, Pérez de Paz, Sosa & Salomone s.n. (TFC No. 52991! [labelled “epitypus”]; isoneotypes: LPA!, MUB!). [For an image of the neotype, see Fig. 4.]

= *Phoenix canariensis* var. *porphyrococca* Vasc. & Franco in Portugaliae Acta Biol., Sér. B, Sist. 2: 313–314. 1948 – **Lectotype (designated here)**: [illustration in] Portugaliae Acta Biol., Sér. B, Sist. 2: 363, pl. XIX, fig. 3. 1948. [For an image of the lectotype, see Fig. 5.]

## ■ INVALID AND ILLEGITIMATE NAMES APPLIED TO *P. SENEGALENSIS*

“*Fulchironia senegalensis*”. — To clarify the status of the name *Phoenix senegalensis* it is necessary to examine



“*Fulchironia senegalensis* Lesch.”, which was explicitly cited in the protologue by André (1892). Desfontaines (1829: 29) cited “*Fulchironia senegalensis* Leseb.”, and, as a synonym, “*Phoenix leonensis* Lodd.” within the category of palms with pinnate leaves, as a “*Fruticosa*” palm, grown in the heated greenhouse at the Jardin des Plantes in Paris. The attribution to “Leseb.” seems to have been a lapsus for “Lesch.” (i.e.,

Jean Baptiste Louis [Claude] Théodore Leschenault de la Tour, 1773–1826). “*Phoenix leonensis* Lodd.” was attributed by Desfontaines to Conrad (L.) Loddiges (1738–1826). Chabaud (1912a) later included, with doubts, these names in the synonymy of *P. spinosa* Thonn.

Sauer (1834: 47) mentioned “*Fulchironia senegalensis* Leseb.”, and its synonym “*Phoenix leonensis* Loddig.”, within



**Fig. 3.** *Phoenix* palm tree grown at the Lisbon University Botanic Garden from which were collected the original materials of *Phoenix senegalensis* and *Phoenix canariensis* var. *porphyrococca*. **A**, General view (Lisbon, October 2009); **B**, Crown (Lisbon, October 2009); **C**, Fruits and leaves (Lisbon, October 2009). — Photos by: D. Rivera.



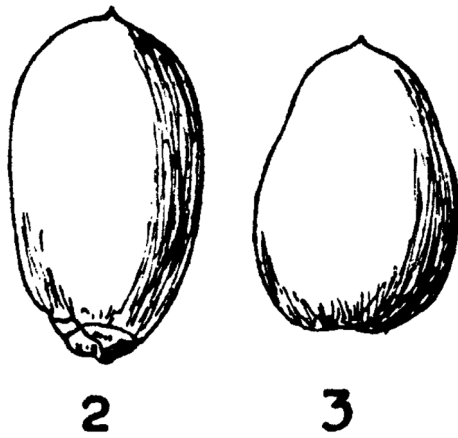
the category of palms cultivated in Potsdam in 1833 and stated Senegal to be the original provenance. According to Mayer (1834) the individual tree was a male blooming in March.

Burel (1868) published “*Fulchironia senegalensis*” followed by statements concerning the horticultural interest of this palm. The entry on page 153 has the following text under the heading “2° *Espèces à feuilles en palmes*”: “*Fulchironia senegalensis*. Excellente plante, mais pour les

grands vases élevés, à cause de ses feuilles qui s’étendent horizontalement. Ce Palmier a aussi le défaut de conserver la poussière dans les folioles de ses feuilles qui forment gouttière; mais il est d’une grande rusticité; peu sensible au froid et d’une très-longue durée lorsqu’on n’oublie pas l’arrosage.” This does not achieve valid publication because the requirements of Art. 38.1(a) are not met by statements merely describing economic usage (gardening) (Turland



**Fig. 4.** Specimen designated as neo-type of *Phoenix senegalensis* André, Pérez de Paz, Sosa & Salomone s.n., 19 Dec 2017 (TFC No. 52991!). — Photo: P.L. Pérez de Paz.



**Fig. 5.** Illustration designated as lectotype of *Phoenix canariensis* var. *porphyrococca* (Carvalho-e-Vasconcellos & Amaral-Franco, 1948). Here is represented, from pl. XIX, fig. 3, which is the image of a fruit of *Phoenix canariensis* var. *porphyrococca*. Figure 2 of pl. XIX, representing *P. canariensis*, is presented for comparison.

& al., 2018). This sentence was reproduced, in English, in *The Gardeners' Chronicle and Agricultural Gazette* (31: 817. 1868) as follows: “*Fulchironia senegalensis*.—An excellent plant, especially for large and tall or raised vases, by reason of its spreading leaves. This Palm has also the bad quality of retaining the dust on its leaflets, but on the other hand it is very hardy, but little sensitive to cold, and does well if freely supplied with water.” It was also reproduced in *The Magazine of Horticulture, Botany* (34: 276. 1868).

In summary, while the designation “*Fulchironia senegalensis*” has been published multiple times in the past, all of these appear to be nomina nuda (e.g., Desfontaines, 1829; Sauer, 1834; Burel, 1868).

***Phoenix senegalensis* as a nomen nudum.** — Van Houtte (1881: 38) first published the designation “*Phoenix senegalensis*” in *Cultures de Louis Van Houtte*, no. 191, within the category of “Graines de Palmiers” but without description, thus the name was a nomen nudum. Salomon (1884) published “*P. senegalensis* Van Houtte” as a synonym under *P. spinosa* Thonn. According to Jackson & Hooker (1895: 501) and IPNI (2017), Salomon first published the designation in 1882, in *Gartenflora* (31: 305), where it was listed as a synonym of *P. reclinata*, however, this reference is erroneous, as Barrow (1998) noted.

***Phoenix menieri* and *P. canariensis* var. *glauca*.** — Almost a decade after the valid publication of *Phoenix senegalensis*, Cochet (1906) introduced *P. menieri* as a replacement name for *P. senegalensis* André. Cochet (1906) considered there to be an earlier validly published *P. senegalensis* that was not conspecific with *P. senegalensis* André. Therefore, he regarded *P. senegalensis* André to be a later homonym for what he considered the true *P. senegalensis*, a West African species, which for Cochet (1906) was morphologically similar to *P. reclinata*. Based on the typification of *P. senegalensis* here, *P. menieri* is a superfluous illegitimate name.

Chabaud (1912b, 1915) described a variety of *P. canariensis* characterized by its glaucous leaves and red to blackish coloured ripe fruits, referred to “*P. senegalensis* auct. non Van Houtte”, and to a living palm maintained at the Nabonnand rose gardens (Golfe-Juan, France). He incidentally mentioned that his variety was a hybrid of *P. canariensis*. However, that statement was made on pages 78–79, just following his statement on the status of *P. canariensis* (Chabaud, 1912b): “Is it a species or a variety? For us, after studying its organs since its introduction to date, we are convinced that *Phoenix canariensis* is only a variety of *Phoenix sylvestris*.” The validity of “*P. canariensis* var. *glauca*” is doubtful since the author did not accept the species with which he was combining the infraspecific epithet.

**“*Phoenix leonensis*”.** — Loddiges (1823) first published the designation “*Phoenix leonensis*” in the list of palms within the category of stove plants, but without description, thus it was a nomen nudum. Loddiges (1830) again published the name without description, and thus again it was a nomen nudum. Previous editions of his work did not include the name (Loddiges, 1820). Kunth (1841) placed “*Fulchironia senegalensis* Leseb.”, and “*Phoenix leonensis* Lodd.” within the synonyms of *P. spinosa*, but this did not validate the designation of Loddiges as is stated by IPNI (2017). This synonymy was adopted by Siebold (1860). Blatter (1910) also included these names within the synonymy of *P. reclinata*.

## CONCLUSION

The first validly published name for the Canary Islands date palms with red-bluish fruits is *Phoenix senegalensis* Lesch. ex André (1892). Presently it is considered a synonym of *P. canariensis*. The first validly published name at the level of variety is *P. canariensis* var. *porphyrococca* Vasc. & Franco (Carvalho-e-Vasconcellos & Amaral-Franco, 1948). We should point out that the references given for the names discussed here in the main nomenclatural databases are incorrect and therefore need to be updated. For instance, in the case of “*P. leonensis*” the errors are nearly identically repeated in IPNI (2017), The Plant List (2018) and Tropicos (2018a), and the same is true for “*Fulchironia senegalensis*”. While the genus “*Fulchironia*” is included in Tropicos (2018b), “*F. senegalensis*”, although repeatedly cited, is in all the sources we studied a nomen nudum.

## AUTHOR CONTRIBUTIONS

DR, Design and writing, selection of plant materials, figures; CO, Literature and text review, photography for figures; FA, Literature and text review; TE, Research in herbariums, photography; MMR, Literature and text review; EC, Molecular studies of samples of the various species and varieties; EL, Literature and text review; DJ, Literature and text review, review of English text; IS, Molecular studies of samples of the various species and varieties, PS, Molecular studies of samples of the various species and varieties and selection, collection and preparation



of plant materials; AN, Selection, collection and preparation of plant materials; FS, Selection, collection and preparation of plant materials; PLPP, Selection, collection and preparation of plant materials. — DR, <https://orcid.org/0000-0001-6889-714X>; CO, <https://orcid.org/0000-0002-0244-601X>; FA, <https://orcid.org/0000-0003-3254-2691>; EL, <https://orcid.org/0000-0002-9674-2767>; DJ, <https://orcid.org/0000-0002-7284-1074>; IS, <https://orcid.org/0000-0002-1606-6253>; PS, <https://orcid.org/0000-0002-8619-3004>; AN, <https://orcid.org/0000-0001-8191-7344>

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