

Table 2. Cont.

Taxon	Provenance (Herbarium Voucher)	Source	ITS	Source	matK
<i>F. pulverulenta</i> L.	South Africa: Redelinghuis (ABH-77205)	Crespo et al. [12]	OR183474	-	-
	South Africa: Skoverfontein (ABH-83195)	This paper	PV241657	-	-
	Spain: Teruel, Alcañiz (ABH-73564)	Crespo et al. [12]	OR183475	-	-
	Spain: Alicante, Cabo de las Huertas (ABH-74763)	This paper	PV241653	This paper	PV258678
	Spain: Albacete, Fuentealbilla (ABH-40820)	This paper	PV241654	-	-
	Morocco: Melga-el-Ouidane (ABH-59986)	This paper	PV241655	This paper	PV258679
	Spain: Canary Isl., Tenerife, Puerto de la Cruz (ABH-79974)	Crespo et al. [12]	OR183477	This paper	PV258680
	Italy: Puglia, Torre Spechiola (ABH-84244)	This paper	PV241656	This paper	PV258681
	Spain: Alicante, Cabo de las Huertas (ABH-41853)	Crespo et al. [12]	OR183476	-	-
<i>F. repens</i> (P.J.Bergius) Fourc.	South Africa: S of Hondeklipbaai (ABH-76862)	Crespo et al. [12]	OR183479	-	-
	South Africa: Velddrift (ABH-76849)	-	-	This paper	PV258682
	South Africa: S of Groenrivier (ABH-76868)	Crespo et al. [12]	OR183478	This paper	PV258683
<i>F. sahariensis</i> M.Á.Alonso & al., nom. nov.	Morocco: Guelmim to Tan Tan (MA-786164)	This paper	PV241658	This paper	PV258684
	Morocco: Sidi Ifni (MA-913227)	This paper	PV241659	This paper	PV258685
<i>F. salsuginea</i> Adıgüzel & Aytas ²	Turkyie: Tuz Gölü, salty lagoon (ABH-45933)	Crespo et al. [12]	OR183467	This paper	PV258687
	Turkyie: Dörtöl (MA-561567)	This paper	PV241660	This paper	PV258686
<i>F. thymifolia</i> Desf.	Algeria: Bougtob, Chott Cherguı (ABH-59344)	Crespo et al. [12]	OR183481	This paper	PV258688
	Spain: Zaragoza: Bujaraloz (ABH-75454)	Crespo et al. [12]	OR183480	This paper	PV258689
<i>F. velutina</i> Brouss. ex DC.	Morocco: Essaouira (ABH-79929)	Crespo et al. [12]	OR183482	This paper	PV258690

¹ Filed in GenBank as the synonym name *R. hypericoides* Willd. (nom. illeg.); ² Filed in GenBank as *F. hirsuta* (see Crespo et al. [12]).

3. Results

3.1. Taxonomic Treatment and Description of New Taxa

3.1.1. *Frankenia sahariensis* M.Á.Alonso, M.B.Crespo, Abad-Brotons, Mart.-Azorín & J.L.Villar, *nom. nov.*

≡ *Frankenia florida* L.Chevall. in Bull. Herb. Boissier ser. 2, 3(9): 768. 1903 [replaced synonym], *nom. illeg.* [non Phil. in Anales Univ. Chile 41: 676. 1872] ≡ *F. pulverulenta* var. *florida* Maire in Bull. Soc. Hist. Nat. Afrique N. 27: 210. 1936 ≡ *F. pulverulenta* subsp. *florida* (Maire) Maire, Cat. Pl. Maroc 4: 1071. 1941. *Type*: ALGERIA. [El Menia Province:] El Goléa [currently El Menia], in arenosis salsis. April 1902, *L. Chevallier* 404 (**lectotype, designated here**: P-06618528!, Figure 1; **isoelectotypes**: P-05145114!, P-06618529!, P-06618525!, MPU-007119!, MPU-007120!, US-00679979 [digital image!],

- GZU-000269792 [digital image!], JE-00003246, JE-00003247 [digital image!], LY-0084391 [digital image!], WAG-0249595 [digital image!], MO-357730 [digital image!]).
- = *F. intermedia* var. *annua* Caball. in Trab. Mus. Ci. Nat., Ser. Bot. 30: 30. 1935. Type: MO-ROCCO. [Western Sahara]: In collibus arenosis insolatis prope Sidi-Ifni, 13 June 1934, A. Caballero (**lectotype, designated here**: MA-78660!; isoelectotype: MPU-300233!).
 - *F. pulverulenta* subsp. *floribunda* sensu Quézel & Santa, Nouv. Fl. Algérie: 685. 1963 [sphalm.]. Note: The subspecific epithet “*floribunda*” is most likely a mistaken desinence for “*florida*”, not a formally proposed name.

Description: *Habit:* Annual or short-lived perennial herbs, weakly lignified at the base, loosely branched, tap-rooted, and mostly glabrous to sparsely puberulous. *Stems:* Non-rooting, usually prostrate to decumbent, 5–30 cm long, often with divaricate branches, with internodes up to 2.5 cm long. *Young branchlets:* Yellowish to reddish, mostly with scattered whitish depositions, glabrous or shortly and densely puberulous, with minute curled or hooked trichomes (0.1–0.2 mm long) only on one side and near the nodes. *Leaves:* Opposite, patent to erect-patent, green or sometimes reddish, and mostly with scattered glands bearing whitish depositions. *Petiole:* 0.5–0.8 × 0.2–0.3 mm, flattened, and tapering distally. *Sheath:* Extending along the petiole margins to the blade, loosely ciliate to subglabrous, with (2–)4–5 pairs of lateral cilia, unequal in length (0.2–0.5 mm long), whitish, cylindric to flattened, and obtuse or acute at the apex. *Leaf blade:* (1.8–)2.5–4 × 0.5–0.7 mm, triangular-ovate to oblong-ovate, mostly subfalcate upwards, with an obtuse apex and a cordate to rounded base, often strongly revolute on margins or flattened in the lower third, somewhat fleshy and glaucescent, concolorous or sometimes slightly paler abaxially, glabrous on the upper side, loosely hairy beneath with short straight trichomes 0.1–0.2 mm long. *Midrib:* Notably thickened, tapering slightly towards the apex, continuous with the petiole and raised abaxially and extending for most of the blade length. *Flowers:* Pentamerous, perfect, sessile, solitary on dichotomies or borne in axillary or terminal dichasial groups, usually condensed and glomerular. *Floral bracts:* Two, leaf-like but smaller, 2–2.5 × 0.5–0.7 mm, erect to erect-patent, connate at the base and shortly covering the calyx base for ca. 0.5 mm, about half the calyx length. *Bracteoles:* Two, bract-like but smaller, 0.5–1.5 × 0.4–0.6 mm, alternating with bracts, erect, strongly revolute on margins, about half the calyx length, with a petiole ca. 0.5 mm long, adnate to the calyx base. *Calyx:* 2.5–4.2 × 0.6–1 mm, tubular at anthesis to gradually fusiform later, often twisted, straight, indurate, sessile, reddish or rarely yellowish, prominently 5-ribbed, entirely glabrous or densely papillate (with a heterogeneous whitish indumentum of long flattened papillae 0.2–0.3 mm long, globose-claviform papillae ca. 0.1 mm long, and minute globose vesicles), only between the glabrous thickened ribs and sometimes with scattered whitish depositions. *Teeth:* Five, 0.5–1 mm long, erect, triangular, acute, cucullate, shortly mucronate at the apex (mucro ca. 0.1–0.2 mm long), narrowly membranous and shortly papillate at the margins. *Petals:* Five, 4–6 × 1–1.5 mm long, exceeding the calyx, obovate–cuneate, pinkish-mauve but whitish below, slightly overlapping laterally, exceeding about half to two-thirds the length of the calyx. *Claw:* 2–2.5 × 0.3–0.4 mm, narrowly cuneate, tapering to the blade, yellowish, and partly hidden into the calyx tube. *Ligule:* 1.5–2 × 0.2–0.3 mm, narrowly oblanceolate, longitudinally adnate to the claw, the free apex ca. 0.2–0.4 mm long, ovate–oblong, obtuse to subacute, and entire. *Blade:* 2.3–3.5 × 1–1.5 mm, broadly obovate–cuneate, rounded at the apex, irregularly erose–denticulate. *Stamens:* Six, in two unequal whorls, overtopping by ca. 1.5 mm the calyx teeth at anthesis; filaments 3.5–5.5 mm long, whitish, expanded ca. 0.5 mm wide in the lower part but gradually tapering and filiform in the distal part. *Anthers:* 0.6–0.8 mm long, yellowish, ellipsoid, versatile. *Ovary:* ca. 1.5 mm long, ellipsoid, subtrigonus, 3-carpelar. *Placentas:* Three, parietal–basal, extending up to the lower half to two-thirds of the carpel wall length, with the ventral traces moderately to profusely

branched. *Ovules*: 9–12 per placenta, attached along most of the placenta by erect funiculi ca. 0.1 mm long. *Style*: 3–4 mm long, terete, whitish. *Stylar branches*: Three, filiform 0.5–0.8 mm long, whitish. *Capsule*: 1.4–2 × 0.8–1 mm, ovoid–ellipsoid, subtrigonal, hidden in the calyx tube, early dehiscent. *Seeds*: 24–30 per capsule, 0.5–0.8 × 0.2–0.3 mm, sulcate on one side, ellipsoid, brown, darker at the funicular part and developing rapidly even before the flower has completely withered. *Testa*: Thin, not mucilaginous, with a surface weakly and irregularly ornamented with a subrectangular–reticulate pattern, finely striate, covered with small-sized papillae 8–17 µm long, homogeneous in shape, globose to conical–obtuse, sessile, more densely disposed on the distal part.



Figure 1. Lectotype of *Frankenia sahariensis* from El Goléa (currently El Menia), Algeria, L. Chevallier 404 (P-06618528!). Scale bar = 1 cm (on the small upper label). © Muséum National d'Histoire Naturelle, herbarium collections, Paris (reproduced with permission).

Etymology: The specific epithet (*sahariensis*, *-e*) refers to the Sahara Desert, the native area of the species. The name replaces the illegitimate “*F. florida* L.Chevall.”, a later homonym of the Chilean “*F. florida* Phil.” (see below). The type of the former was collected in 1902 and distributed by Louis P.D. Chevallier with number 404 of his exsiccata *Plantae Saharae Algeriensis*.

Flower and fruit production: Flowering in early January–early June (occasionally in August–September) and fruiting in February–July (occasionally in September–October).

Habitat and distribution: *Frankenia sahariensis* is found in mostly sandy soils and in subsaline depressions, often along ravines and wadies, at elevations of 0–1300 m. It is endemic to the western parts of the Sahara Desert [55], south of the High Atlas Range, spreading from the Atlantic coast of northern Mauritania and southern Morocco to central and eastern Algeria and northwestern Mali (Figure 2). Biogeographically, and according to the current data, it is endemic to the western parts of the Saharan province of the Saharo–Arabian region of Takhtajan [34]. In this vast territory, *F. sahariensis* occurs in halophilous vegetation types within the Oceanic Saharan, Western Saharan, Northwestern Saharan, and Steppe–Northern African domains of Quézel [33].

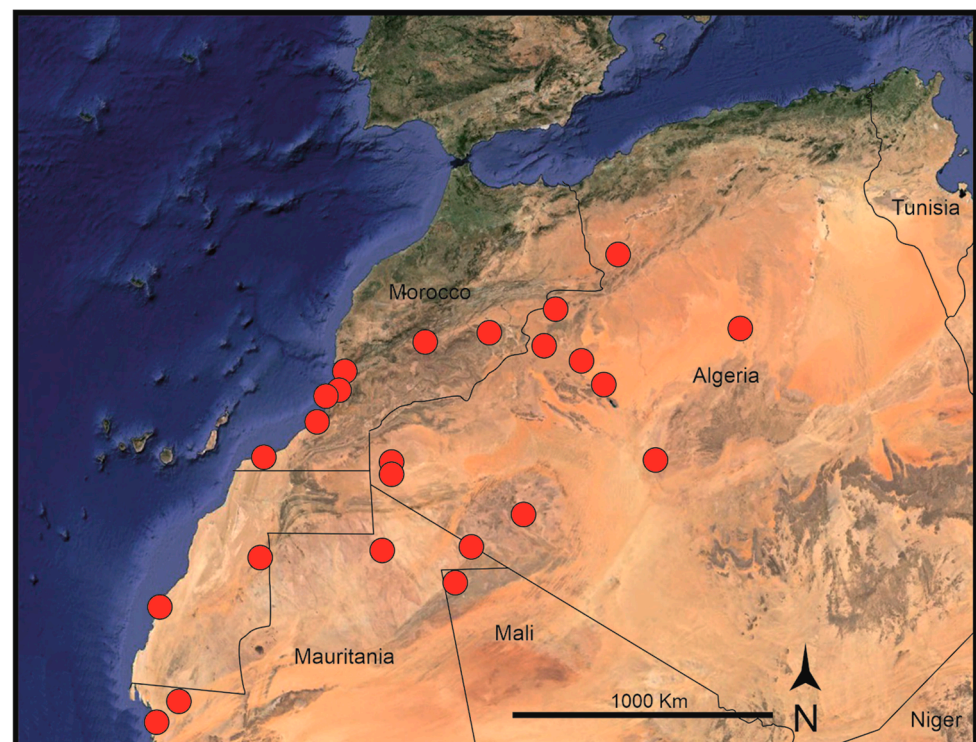


Figure 2. *Frankenia sahariensis*. Distribution map of the studied material.

Nomenclatural remarks: Chevallier [56] first described this remarkable plant after his collections near El Goléa (currently El Menia) in the Saharan region of southern Algeria. It was named “*F. florida*”, most probably due to the outstanding showy flowers it exhibits at anthesis. However, the earlier homonym *F. florida* Phil. had already been used for a Chilean congener [57], a fact that made Chevallier’s name illegitimate (Art. 53.1 of the ICN) and unavailable for use. Nonetheless, since the Saharan plant somewhat resembles *F. pulverulenta* (see below), it has often been subordinated to the latter at different infraspecific ranks. First, Maire [58] accepted it as a variety and indirectly validated the name *F. pulverulenta* var. *florida* Maire (Art. 58.1 of the ICN). Later, this basionym was treated by Maire [24] at the subspecies rank, a currently broadly accepted combination (see [4,59]). Nonetheless, when treated at a specific rank, no previous valid names are available for the Saharan plant, and

therefore a replacement name, *F. sahariensis* nom. nov. (Art. 6.11 of the ICN), is proposed here for the illegitimate *F. florida* L. Chevall.

Other studied material: ALGERIA (DZA). **Béni Abbès Province:** Sahara, Moyenne vallée de la Saoura, June 1941, *Volkonsky* (MPU-300246!). Sahara: Embouchure de la Saoura, May 1926, *Balachowsky* (MPU-300247!). **Djanet Province:** Sahara Central, Tassili N'Ajjer, lieux humides à Ahrème, en aval d'Thérir, 7 January 1966, ? (P-05145224!). **El Menia Province:** Loc d'El Goléa [currently El Menia], vases salées, April 1954, *P. Quézel* (MPU-300243!). **Naâma Province:** Sfisifa, 3 June 1887, *A. Bousquet* (MPU-048475!). Aïn-Sefra, 21 April 1888, *E. Bonnet & P. Maury* (P-06801050!). **Tindouf Province:** Sahara Occidentale: Oued Jehach entre Tindouf et l'Oued Drâa, lieux sableux, printemps 1938, *Ollivier* 187 (MPU-048470!). Sahara Occidentale, Tindouf, assez abondant, March 1928, *Dr. Estival* (MPU-048483!). Sahara Occidentale, Region de Chenachane, Chenachane, ? 1923, *Dr. Tripeau* (MPU-300238!). Sahara Occidentale, Nkheila, jardin, 29 March 1995, *Monod* 19676 (P-05038753!). Ibidem, zone d'épandage, *Monod* 19678 (P-05038755!). Ibidem, *Monod* 19679 (P-05038747!). Sahara Occidentale, Entre Nkheila et Rabouni, 30 March 1995, *Monod* 19703 (P-05038750!). MALI. **Tombouctou Region:** El Mzereb (El Hank), dans un terrain sale, 20 April 1954, *J. Sougy* 392 (P-00799803!). MAURITANIA. **Dakhlet Nouadhibou Province:** Ténaloul (Ten Alloui), sebkhas du littorale, 22 April 1938, *Murat* 2390 (P-05038740!, MPU-300262!). Iouik [Iwik], côte de Mauritanie, 9 April 1982, *Th. Monod* 18336 (P-05038748!). **Tiris Zemmour Province:** Soudan Français, Chegga-Guelta, 3 January 19 [38], [*O. de*] *Puygaudeau* (P-05038749!). Sahara Occidental, Falaise du Hank, ravin d'Aïn-Chegga, Janvier 1939, *Dr. Rolland* 106 (MPU-048484!). MOROCCO. **Dakhla-Oued Ed Dahab Region:** Dakhla, río de Oro, 28 May 1977, *Th. Monod* 16192 (P-05144446!). **Drâa-Tafilalet Region:** Daoura, dans une dava, sur la Hammada de la Daoura, 2 h vers la vallée vers Hachi-Chamba, 9 April ?, *Dr. Le Carbout* (MPU-300240!). Daoura, dans la vallée de la Daoura vers Achi-Chamba, 17 May ?, *Dr. Le Carbout* (MPU-300241!). Entre Ouarzazate et Skoura, 25 March 1932, *F. Peltier* (MPU-048495!). Drâa, graviers de l'Oued Imini à Ouarzazate, 14 February 1936, *Gattefossé* (MPU-967102!). **Guelmim-Oued Noun Region:** Oued Noun, *Ollivier* 14 (MPU-300264). In aridis subsalsis inter Labyar et Notfia, 1 April 1937, *R. Maire* (MPU-300242!). Anti-Atlas, Goulimine (Guelmin), 23–28 August 1936, *M. Langueron* (MPU-300234!). Prov. Guelmim, 53 km from Guelmin on road to Tan-Tan, near café, 7 February 2007, *S. Jury & T.M. Upson* 20492 (MA-786164!). Prov. Guelmime, 14 km WSW of von Guelmime an der Straße (P41) nach Tan-Tan, ca. 200 m elev., 28°56' N 10°08' W, 15 April 1997, *D. Podlech* 53647 (W-0365982!, RSA-0548173 [digital image!]). Entre Goulimine (Guelmin) et El Aioun du Drâa, 6 September 1941, *J. de Lepiney, Ch. Runge & Ch. Sauvage* 2035 (MPU-759265!). **Laâyoune-Sakia El Hamra Region:** Sahara Occidental: El Aaiun (Seguia el-Hamra), *Izik [Mision d'Études de la Biologie des Acridiens 2482]* (MPU-300239!). Sahara Occidentale: Zemmour [Gueltat-Zemmour], dans les regs près de la Guelta, March-April 1934, *Luthereau* (MPU-300237!). **Souss-Massa Region:** In planitie at septentr. urbis Tiznit, 13 April 1934, *R. Maire & E. Wilczek* (MPU-300236!). Prov. Tiznit, beach west of Gourizime, near the road from Tiznit to Sidi-Ifni, 20 m elev., 29°37' N 10°02' W, 14 April 1997, *D. Podlech* 53623 (W-0365981!). Prov. Tiznit, Oued Massa ca. 40 km from Tiznit, 50 m elev., 3 April 1994, *A. Tribsch* (W-0365983!). Souss-Massa-Drâa, Tiznit, Ifni Mesti, sur del puerto de Sidi Ifni, 24 March 2015, *D. Gutiérrez et al. DG503* (MA-00913227!). Prov. Agadir, 10 km NW of Agadir, at the coast, 120 m elev., 30°29'26" N 9°40'17" W, 19 June 1996, *A. Achhal et al.* 96-0511 (W-0365985!). In depressis subsalsis ad Tigert, prope Herculis Promontorium (Cap Ghir), 4 April 1937, *R. Maire* (MPU-300235!). Sud-Ouest du Maroc, Imeoghguemmi, ? 1875, *Mardochée* (MPU-750398!). In arvis prope Tasila, ad ostium fluminis Massa, 3 April 1937, *R. Maire* (MPU-300251!). In arenosis ditionis Tazeroualt, in faucibus Sidi-el-Ghiat, 400 m elev., 12 April 1934, *R. Maire & E. Wilczek* (MPU-300263!).