



A taxonomic revision of *Crambe*, sect. *Leptocrambe* (Brassicaceae)

ANIBAL PRINA

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As part of a revision of the genus *Crambe* based on the morphological study of herbaria and cultivated material, the systematics of sect. *Leptocrambe* DC. is presented here. Section *Leptocrambe* is considered to comprise five species: *C. kilimandscharica* O. E. Schulz, *C. sinuato-dentata* Hochst. ex Petri, *C. hispanica* L., *C. filiformis* Jacq. and *C. kralikii* Coss. *C. hispanica* includes three subspecies, subsp. *hispanica*, subsp. *glabrata* (DC.) Cout. and subsp. *abyssinica* (Hochst. ex R. E. Fr.) **stat. nov.** which includes var. *abyssinica* and var. *meyeri* (O. E. Schulz) **comb. nov.** *C. kralikii* includes two subspecies, subsp. *kralikii* and subsp. *garamas* (Maire) Podlech.

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ADDITIONAL KEY WORDS:—Cruciferae – East Africa – Mediterranean Basin.

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INTRODUCTION

Crambe, with *c.* 34 species, is one of the largest genera within the tribe Brassiceae. It has a wide west to east distribution, from the Macaronesian archipelagoes to the western Himalaya. It is composed mainly of hemicryptophytes, camephytes and a few annual herbs.

Mediterranean and East African species of *Crambe* were included in section *Leptocrambe* DC. by De Candolle (1821), a criterion followed later by Prantl (1891) and Schulz (1919). A recent study of cp-DNA on several species of the genus confirmed the close relationship between Mediterranean and East African species

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(Warwick *et al.*, 1997). However, based on a recent study of nuclear ribosomal DNA, one member, *C. kilimandscharica* O. E. Schulz, could be close to the Central Asian species of sect. *Oriente crambe* Khalilov (Francisco Ortega *et al.*, 1999) and would constitute the base of radiation of this section. On the other hand, in fruit morphology *C. kilimandscharica* is close to the Macaronesian species (sect. *Dendrocrambe* DC.), although all other morphological traits and the annual life history bring it closer to the other species of sect. *Leptocrambe*, which is the only one with annual taxa.

It is appropriate to review and update Schulz's (1919) treatment, taking into account current knowledge of the genus.

Khalilov (1991) subdivided sect. *Leptocrambe* into two subsections—*Hispanicae* I. Khalilov and *Kilimandscharica* I. Khalilov—on the basis of fruit morphology. He characterized subsection *Kilimandscharica* on the ovate and reticulate upper part of fruit. These traits are shown by *C. kilimandscharica*, but definitely not by *C. sinuato-dentata* R. E. Fries, in which the upper part is spherical and smooth.

Three taxa of section *Leptocrambe* grow around the western Mediterranean basin, *C. hispanica* subsp. *glabrata*, *C. filiformis* and *C. kralikii*, whereas *C. hispanica* subsp. *hispanica* grow along the north and east of the Mediterranean basin. The remaining taxa are restricted to the savannas and highlands of east Africa, although *C. hispanica* subsp. *abyssinica* was cited as a crop weed in Australia (Hewson, 1982, sub *C. abyssinica*).

TAXONOMIC TREATMENT

Sect. *Leptocrambe* DC., *Reg. Veg. Syst. Nat.* 2: 650–655 (1812)

Annual herbs with leafy stems or short perennials with rather few caulinar leaves. Petals oblong-obovate, gradually narrowing towards the base into a short claw. Lower part of the silicula very short, 0.4–1 mm long or 1.8–5 mm long in perennial species; upper part spherical, generally smooth or slightly 4-ribbed, shiny, with 1 seed not adhering to the pericarp. Seed frequently adhering to the tetragonous and rough pericarp in *C. kilimandscharica*.

Type species. *Crambe hispanica* L. (see Khalilov, 1991). The species of this section can be identified with the following key:

1. Upper part of the fruit neatly 4-ribbed, tetragonous, rough-reticulate between ribs; seed frequently adhering to the pericarp *C. kilimandscharica*
 Upper part of fruit spherical, sometimes slightly 4-ribbed, smooth between ribs; seed never adhered to the pericarp 2
2. Annual herbs. Lower part of the fruit 0.5–1 mm long 3
 Short perennials. Lower part of the fruit 1.5–3 mm long 7
3. Petals shorter than sepals, frequently lacking. Plants glabrous
 *C. sinuato-dentata*
 Petals larger than sepals, always present. Plants hairy, rarely glabrous 4
4. Basal leaves with reniform or heart-shaped apical segment. Upper part of fruit smooth, without ribs 5
 Basal leaves with obovate to ovate-rhomboid apical segment. Upper part of fruit slightly 4-ribbed 6
5. Plants densely hispid. Upper part of fruit 2.5–3 mm diam.
 *C. hispanica* subsp. *hispanica*

- Plants glabrescent to sparsely hispid. Upper part of fruit 4–5 mm diam.
 *C. hispanica* subsp. *glabrata*
6. Filaments of the inner pair of stamens with a short appendage on the upper part. Plants sparsely hispid *C. hispanica* subsp. *abyssinica* var. *abyssinica*
 Filaments of the inner pair of stamens without a short appendage. Plants glabrescent *C. hispanica* subsp. *abyssinica* var. *meyeri*
7. Lower part of fruit 2.5–3 mm long. Basal leaves with reniform apical segment and 7–10 pairs of lateral segments *C. filiformis*
 Lower part of fruit 1.5–1.8 mm long. Basal leaves with 1–2 pairs of lateral segments
8. Basal leaves with the distal lateral segments not confluent with the apical one. Filaments of the inner stamens with a short appendage on upper part
 *C. kralikii* subsp. *kralikii*
 Basal leaves with the distal lateral segments not confluent with the apical one. Filaments of the inner stamens with a long appendage .. *C. kralikii* subsp. *garamas*

Crambe kilimandscharica O. E. Schulz, *Bot. Jahrb. Syst.* 54 *Beibl.* 119: 54 (1916)
 Fig. 1D, E

Ind. loc. "Ostafrika in Usagara-USambara (*C. Holst n. 267, 3737*); Kilimandscharo bei Maragu (*G. Volkens n. 240, 1706*); Mpororo (*Stuhlmann n. 2172*)".

Illustration. Schulz (1919: 246, fig. 31). Jonsell (1982: 14, fig. 4).

Annual herbs, variable in size and habit, frequently hispid on leaves and stems. Stems erect, ribbed, branched only on upper part. Lower and median leaves with petiole 1.8–2.5 cm long. Blade 5–10 cm × 3–6 cm, lyrate-pinnatifid to lyrate-pinnatisect, with the apical segment ovate, cuneate or rarely truncate at base, biserrate and 2–3 pairs of lateral segments, much smaller than the apical one to vestigial near the base; upper leaves petiolate to sessile, blade narrowly rhomboid to lanceolate, pinnatisect, serrate. Inflorescence compact to spreading after anthesis, pedicels 2.5–5 mm long, erect; sepals 1.5–2.5 mm long, glabrous, elliptic, narrowly albo-margined; petals 1.5–2.3 mm long, white, narrowly spatulate, equal or slightly shorter than the sepals; inner stamens 2–3 mm long, without appendage; anthers 0.5–0.7 mm long, style narrowly ellipsoid, 6–8 times longer than the ovary in flower. Lower part of fruit linear, aspermous, 0.4–0.6 mm long; upper part widely ellipsoid, rough-reticulate, 4-ribbed, 2.5–4 mm × 2.5–3 mm, with only one seed frequently adhering to the pericarp.

This species grows along the Rift Valley in Kenya, on the Kilimanjaro range in Tanzania and in other mountainous regions of south-east Ethiopia, Rwanda and Uganda, in grasslands and open woods at 1200–1300 m, and as a weed (Jonsell, 1982; fig. 1).

Examined type specimens. KENYA. Kilimancharo, bei Maragu, iv.1893, *Volkens 240* (Isosyntypus BM); Mt Kilimancharo, i.1894, *Volkens 1706* (Isosyntypus LE).

Selected herbarium specimens. ETHIOPIA. Sidamo. Mega, South Ethiopia, 4°5'N–38°20'E, 2200 m, 24.xi.1952, *J. B. Gillet 14430* (photo K). KENYA. Colas Hill, c. 2200 m, 1922, *Fries 1065* (K); Msampolay Valley, eastern side overlooking of the Rift, 8600 ft, 17.vi.1972, *Greenway & Kanuvi 15015* (K); Lake Naivasha area, 6200 ft, 22.vi.1976, *C. Polhill 475* (K); Narok District, Nduyangerro, about 3 miles

A. PRINA

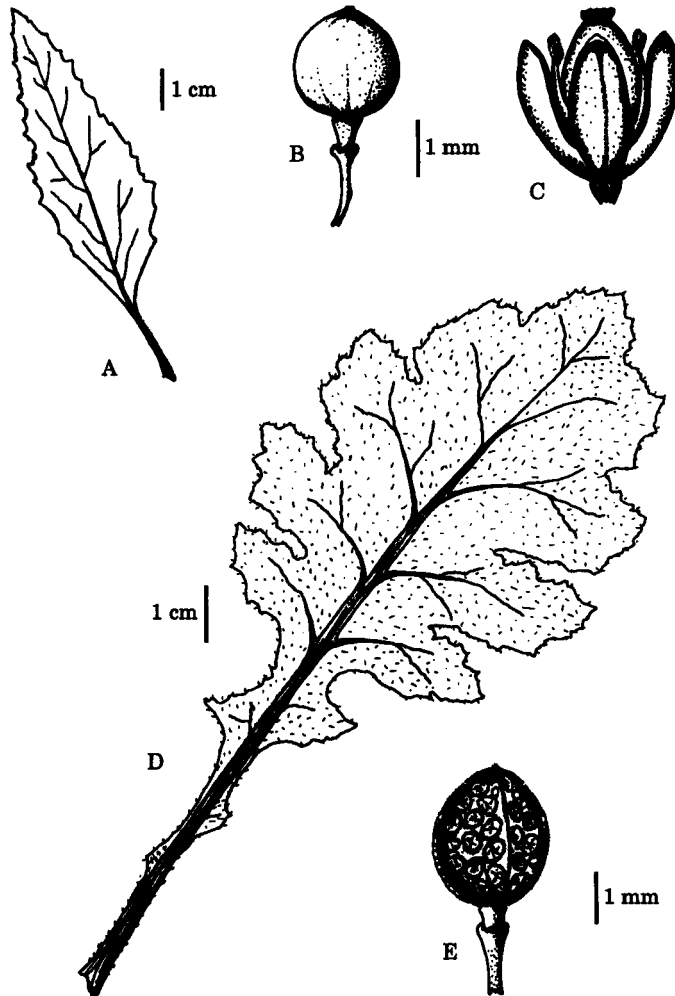


Figure 1. A–C, *Crambe sinuato-dentata*. A, caulinar leaf. B, Fruit. C, flower (Gilbert et al. 4536 K). D–E, *Crambe kilimandscharica*. D, basal leaf. E, fruit (Fries 1065 K).

Olulunga, 6000 ft, 6.vi.1961, *Glover & al 1709* (K); Ngong Hills, 7300 ft, 9.vii.1939, *Bally 95* (BM); Soysambu, Elmenteita, 6000 ft, 31.vii.1948, *Bogdan 1854* (K). TANZANIA. Golongolo-Mkumbala, W Usambaras, 1800 m, 4.vi.1953, *Drummond & Hemsley 2868* (K); Ngare Nairobi, Moshi, 4000 ft, i.1928, *A. E. Haarer 926* (K); Ngare Nairobi, 5100 ft, 19.vi.1944, *Greenway 6841* (K); Ngorongoro crater, 2500 ft, 21.i.1950, *Kruppines 5* (BM); Ngorongoro, crater floor, 1700 m, 13.i.1989, *T. Poc's & S. Chueva 89018a* (K). RWANDA. Kivu. Kabale, Bugabe, 17.i.1957, *Gutwiller 661* (K); Muhavura, 17.x.1929, *Snowden 1530* (BM). UGANDA. Bugishu, Bulambuli, 9500 ft, 4.ix.1932, *A.S.T. 582* (K); Bugishu, Elgon Mt, 11 000 ft, 12.xi.1933, *Tothill 2343* (K); Kiges District, Muko, Lake Bungoni, 30.x.1929, *Snowden 625* (BM, K); Kachwechano farm, 6800 ft, ix.1949, *Purseglove 3109* (K).

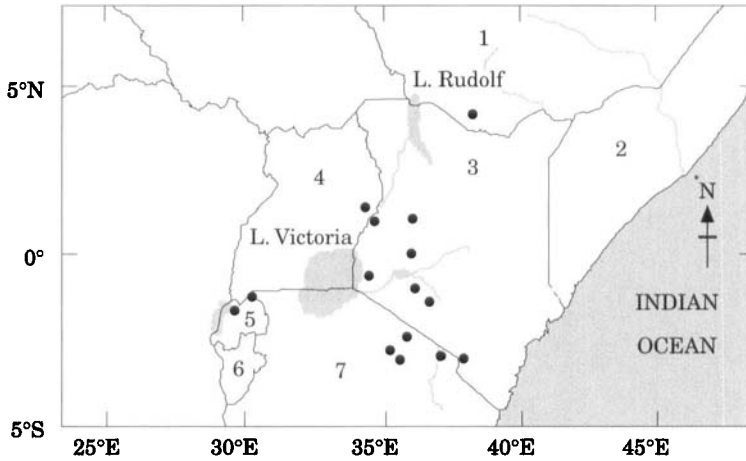


Figure 2. Distribution of *Crambe kilimandscharica* in eastern Africa. The points indicated on the maps in Figures 2, 3, 5, 6, 8, 9, 11 represent places of collection. One point does not always correspond to one herbarium specimen, but may represent more than one. 1, Ethiopia. 2, Somalia. 3, Kenya. 4, Uganda. 5, Rwanda. 6, Burundi. 7, Tanzania.

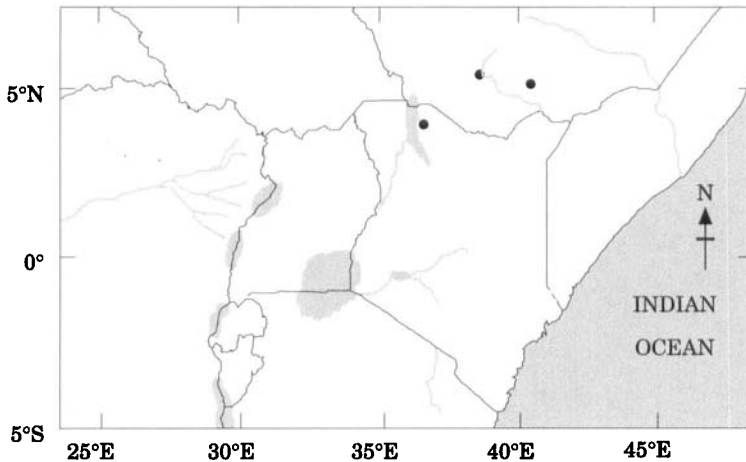


Figure 3. Distribution of *Crambe sinuato-dentata*.

Crambe sinuato-dentata Hochst. ex Petri, in Schweinf., *Beitr. Fl. Aethiop.* 1: 238 (1867)
Fig. 1A–C

Ind. loc. "Auf Büschelmalsfeldern 5000' über dem Meere bei Dschadscha in Abyss. im Aug. u. Sept. 1854, bl. u. Fr. (*Schimper*)".

Annual herbs, glabrous, 12–20 cm tall and much branched from the base, or 50–60 cm tall and branched only in upper half. Basal and median leaves shortly petiolate, blade oblong-rhomboid, 3–7 cm × 1.5–4 cm, sinuate to coarsely dentate; upper leaves sessile, smaller. Inflorescence scarcely branched; sepals green, narrowly albo-marginate; petals frequently lacking or smaller than the sepals; inner stamens 1.8–2.3 mm long, without appendage. Fruit with lower part obconic, 0.5–0.7 mm long, aspermous, and upper part spherical, 2–3 mm diam., smooth, 1-seeded.

This species grows in east Africa, on riverbanks and wet places at 800–2000 m; in Ethiopia has been recorded as a weed in cultivated fields (Jonsell, 1982) (Fig. 3).

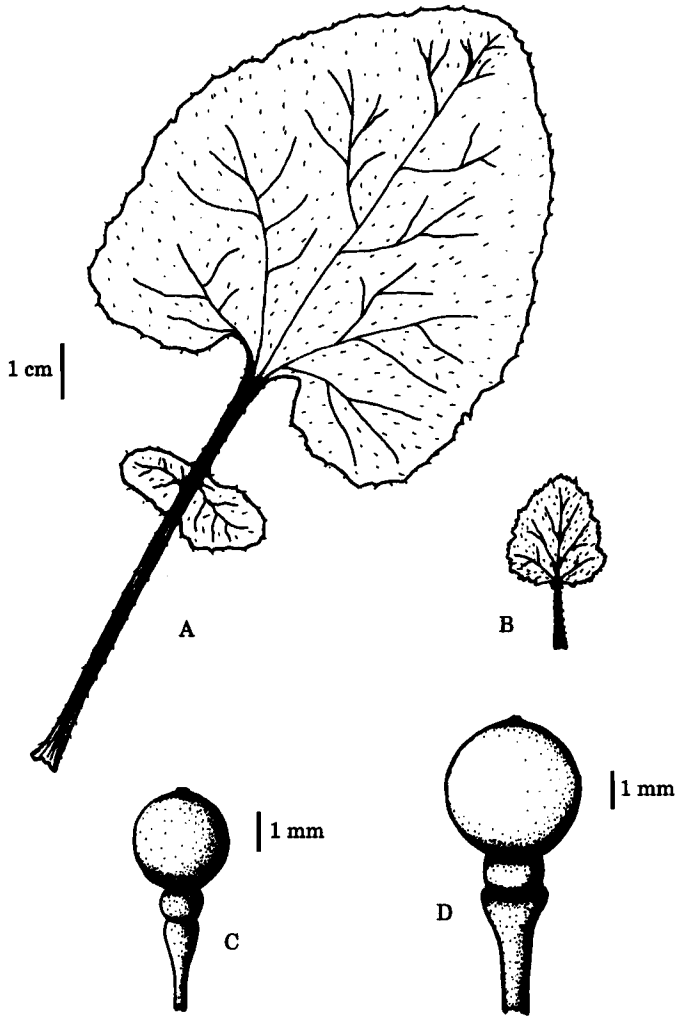


Figure 4. *Crambe hispanica* subsp. *hispanica*. A–C, var. *hispanica*. A, basal leaf. B, upper caulinar leaf. C, fruit (USDA 388835). D, var. *glabrata*, fruit (USDA 378590).

Examined type specimens. ETHIOPIA. Dschadscha, in agris, alt. 5000 ft, *Schimper* 87.1157, *Ed. Hohenacker* 2151 (isotypus BM).

Selected herbarium specimens. ETHIOPIA. Old airfield, c. 15 km north-north-east of Yabelo, 4°59'N–38°13'E, 1700 m, 14.v.1976, *Gilbert & Jefford* 4536 (K, photograph). KENYA. Kajiado district, Selengai Game post, 4230 ft, 15.xii.1969, *Kanore Kibue* 91 (K).

Crambe hispanica L., *Sp. Pl.* 2: 671 (1753)
Ind. loc. "Habitat in Hispania".

Crambe hispanica subsp. *hispanica*

Fig. 4A–C

= *C. hispanica* L. var. *major* Moris, *Fl. Sard.* 1: 110 (1837).



Figure 5. Distribution of *Crambe hispanica* subsp. *hispanica* in the eastern Mediterranean.

Ind. loc. "In apricis litoreis rupestribus montis Cea Bari, et ad sepes in maritimis circa Tortoli".

= *C. gracillima* Rech. fil., *Phyton* 3: 45 (1951).

Ind. loc. "Persia austro-occid. prov. Khusistan vel Isfahan: Siachal, Bakhtiari, along stream, 18 inch. high, flower withe, 9.v.1940 (*Koelz n° 15249*, Tipo in hb. Mus. Wien, Syntipo in hb. Nation. Arboret Belsville)".

—*C. abyssinica* Hochst. ex R. E. Fries, *nom. rejic.* according to Jonsell, *Bot. Not.* 129: 126 (1976), *pro parte*.

—*C. filiformis sensu* Post, *Flora of Syrie, Palestine and Sinai* 1: 130 (1896).

Illust. Zohary (1966: 472, plates).

Annual herbs with stems 40–100 cm tall, erect, ribbed, densely hispid at base, sparsely hairy and branched on the upper half. Basal and median leaves with petiole 3.5–6 cm long, blade lyrate-pinnatifid, 4–15 cm × 7–13 cm, apical segment reniform to heart-shaped irregularly crenate-toothed, with (0) 1–2 pairs of lateral, smaller segments; upper leaves frequently undivided, sessile to petiolate, acutely ovate to rhombic; all leaves densely hispid on both surfaces. Inflorescence with several lateral long branches, 30–40 cm during the fruiting stage, pedicels slender, glabrous, ascendent, 4–8 mm long (10 mm in fruit); sepals elliptic, 1.5–3 mm long, glabrous; petals white, spatulate, 3.5–4 mm long, shortly clawed; inner filaments with teeth near the apex, anthers 0.5–0.8 mm long; lower part of the fruit cylindrical, 0.7–1.0 (1.5) mm long, with 0–1 ovule; upper part spherical to ellipsoid, smooth, 3–4 times as long as the lower, 2.5–3 mm diam., 1-seeded.

The plant grows around the Mediterranean Basin, in Sardinia, southern Italy, the Aegean islands, Cyprus, Jordan, Israel, Syria and western Iran (Moris, 1837; Post, 1896; Schulz, 1919; Zohary, 1966) (Fig. 5).

Examined type specimens. LINN 849.5 (photograph), lectotypes designated by Jonsell (1982).

Selected herbarium specimens. ITALY. Apulia, Gargano ad sepes prope Carpino, 13.vi.1875, *Porta & Rigo 264* (MPU); Catania, In collibus herbosis maritimus, *Todaro 1329* (MPU). GREECE. Cephalonya island, *De Heldreich* (MPU); Messina, Pilos,

16.v.1889, *Abd-ur-Rahman Nadji* (MPU). CYPRUS. Larnaca, Tib-Lapithon, 3.iv.1941, *Davis 3012K* (E). ISRAEL. Moabiticæ, Ayun Musa, 500 m, 22.iv.1911, *Meyers & Dinsmore 847* (E); Hierosolimitanæ, Bab el Wad, 3.iii.1906, *R. Peterson 2847* (E); Aurantitæ, Jerash, 530 m, 4.v.1911, *Meyers & Dinsmore 9847* (E); Palaestina, Mare Mortuis, Wadi Kefren, 200 m, 21.iv.1911, *Meyers & Dinsmore 3597* (E); Quislom Mt, 27.iii.1960, *Zohary* (E); Palaestina, 8.iii.1906, *Aaronshn 989* (MPU). JORDAN. Palaestina jordanicæ, Ain el Jabijha, 200 m, 31.iii.1911, *Meyers & Dinsmore 1597* (E); Petra, 12.iv.1945, *Davis 9316* (E). SYRIA. Southern Syria, Tiberias, 1833–1834, *B. T. Lowe* (E). IRAN. Lorestan, northern and western Iran, Sheshom, 33°6'N–47°43'E, 700–750 m, 27.iv.1963, *Jacobs 6423* (E, photo K sub *C. gracillima* Rech. fil.).

Material studied in cultivation. SPAIN: Cult. Hort. E.T.S.I.A., U.P.M., ex sem. USDA 388835.

In spite of its epithet, this plant does not grow in Spain nor the Iberian Peninsula. Although Gómez-Campo (1993) admits the existence of hairy plants in the Iberian Peninsula, none of the specimens seen herein is as hirsute as those included in subsp. *hispanica*; they are all slightly hairy or glabrescent, and definitely belong to subsp. *glabrata*, as is indicated by fruit size. Doubt remains as to why Linnaeus stated “Hispania” in his protologue.

Crambe hispanica subsp. *glabrata* (DC.) Cout., *Fl. Portugal*: 272 (1913)

Fig. 4D

≡ *C. glabrata* DC., *Prodr.* 1: 226 (1824), basionym.

Ind. loc. “In Hispaniâ propè Sanctum Philippum”.

= *C. hispanica* L. var. *glabrata* (DC.) Coss., *Comp. Fl. Atl.* 2: 309 (1887).

= *C. glabrata* DC. var. *glabrata* subvar. *borjæ* O. Bolòs & Vigo, *Bull. Inst. Cat. Hist. Nat.* 38 (Sec. Bot., 1): 75 (1974).

Ind. loc. “Corbera de la Ribera, *J. Borja 1945* (BC 100301)”.

= *C. cordifolia* Duf., *Ann. sc. Phys. Genev.* 7: 308 (1820), non Stev. (1812).

Ind. loc. “Hab. ad radices umbrosas rupium setabensium in regno Valentino”.

= *C. tetuanensis* Pitard, *Expl. Sci. Maroc. Bot.*: 8 (1912), *nomen nudum*.

Ind. loc. “Maroc Septentrional: *Semsa*”.

— *C. maritima* auct., non L. (1753).

Annual herbs with leaves and stems sparsely hairy to glabrescent. Fruits with the upper part larger than 4–5 mm diam.

It grows in the Iberian Peninsula, and in Morocco from the Rif mountains to the Median Atlas and Anti-Atlas ridges. It was reported from the eastern Mediterranean Basin, including Israel (Zohary, 1966), but all examined specimens from this area correspond to subsp. *hispanica* (Fig. 6).

Examined type specimens. MOROCCO. Tetuan: Semsâ, in aridis, vi.1912, *Pitard 960* (type of *C. tetuanensis* Pitard MPU).

Selected herbarium specimens. SPAIN. Pontevedra: Villagarcía de Arousa, Isla Malveira Chica, 10.ix.1982, *Valdés Bermejo 9202* (MA 529861); Salamanca: Aldeadávila, 8.v.1976, *F. Amich* (MA 225111); Cáceres: Castillo de Monfragüe, 25.iv.1980, *D. Belmonte* (MAF 108558); Hinojales, a orillas del pantano, 10.iii.1997, *Gómez Campo*

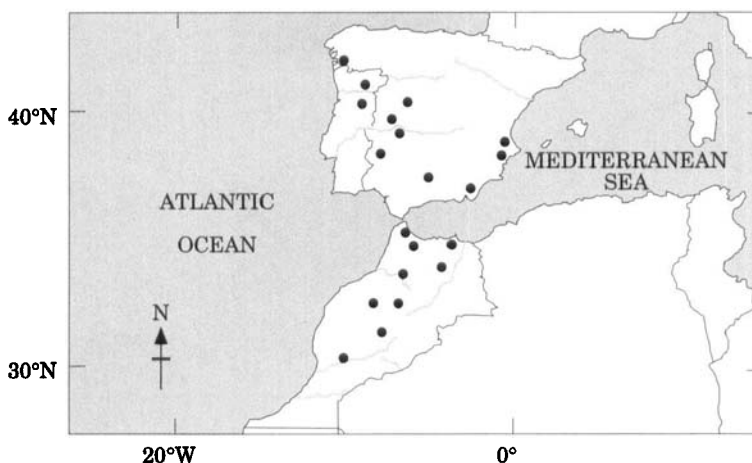


Figure 6. Distribution of *Crambe hispanica* subsp. *glabrata* in Spain, Portugal and North Africa.

(MA 609114); Badajoz: Herrera del Duque, 7.vi.1969, *Ladero y Valdés Bermejo* (MAF 73596); Pantano de Pto. Peña, 28.iii.1977, *Ladero y Rivas Goday* (MA 558145, MAF 147527); Ciudad Real: Valle de Alcudia, Pto. de Mestanza, 2.xi.1979, *Fuertes Lasala* (MA 293374); Valencia: S. de La Murta, *J. Borja* (MAF 17259); Alicante: oppidulum Denia, Montgó, supra Jesús Pobre, 450 m s.m., 19.vi.1975, *C. Blanché & al.* (MA 24358); Játiva, iii.1921, *Clam 3257* (MA 47034, 335501); Granada: Sierra Nevada, Rio Genil, camino de La Estrella, 7.vii.1988, *R. Gavilán* (MAF 129820); Almería: Cerrón de Lucainena, 21.iv.1921, *Gros 79* (MA 47032). MOROCCO. Chaouen: Chaouen, 700 m s.m., 21.iv.1928, *Font Quer 132* (MA 47038, MPU); Ifrane: Azrou, 27.iii.1921, *Maire* (MPU); Lalla Zitouna, 31.iii.1923, *Maire* (MPU); Meknès: El Harcha, Jebel Mouchchene, 28.iv.1963, *Mathez 541* (MPU); Ain-el-Grinab, 8.vi.1963, *Mathez 811* (MPU); Jebel Hadid entre Tiddas y El Harcha, W du route principal, 700 m s.m., 19.iv.1964, *Mathez 1540* (MPU); Vallée du Ouad Mirhanime, NE de Ouljer-es-Soltane, 20.iii.1965, *Mathez 2437* (MPU); Moulay-Bouazza, riviere droit du Ouad Kherrig Moazouz, 9.iii.1966, *Mathez 3451* (MPU); Tafraoute: Igherm, Anti Atlas, 1600–1700 m s.m., 19.iv.1931, *Maire* (MPU). Taza: Bab Moronoy, iv.1917, *Ducellier* (MPU).

Herbarium specimens from cultivated plants. FRANCE. Semmé le 8 fevrier, DR. 8.v.1854, graines de San Felipe de Xativa, cultivé dans le *Jardin des Plantes de Montpellier*, *E. Bourgeau* (MPU).

Material studied in cultivation. SPAIN: Cult. Hort. E.T.S.I.A., U.P.M., ex sem. USDA 378590.

Crambe hispanica subsp. *abyssinica* (Hochst. ex E. R. Fries) A. Prina **stat. nov.**

var. *abyssinica*

Fig. 7A, B

≡ *C. abyssinica* Hochst. ex R. E. Fries, *Wiss. Ergebn. Schwed. Rhod.-Kongo Exped.* 1: 54 (1914), basionym.

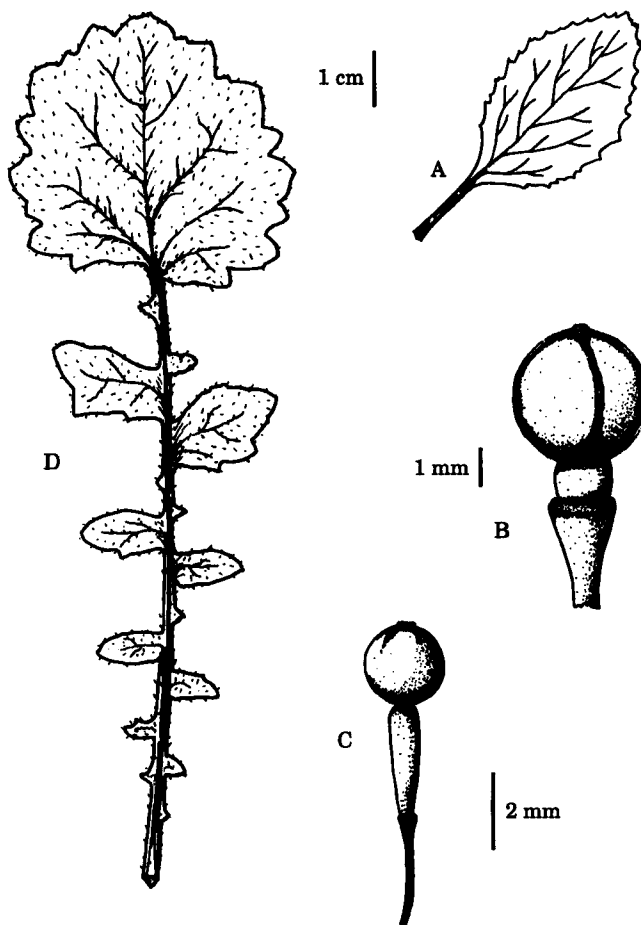


Figure 7. A–B, *Crambe hispanica* subsp. *abyssinica* var. *meyeri*. A, caulinar leaf (A. Prina 1001 MA). B, fruit (USDA 279346). C–D, *Crambe filiformis*. C, fruit. D, basal leaf (USDA 372927).

Ind. loc. “Crescit in locis umbrosis prope Gapdia (Provincia Tigré), mense Septembre fructifera (Schimper)”.

= *C. juncea* sensu Hochst., non Marsch.-Bieb. (1819), in herb.

—*C. hispanica* sensu Richard, *Tent. Fl. Abyss.* 1: 24 (1843).

—*C. hispanica* sensu Jonsell, *Bot. Not.* 129: 126 (1976), *pro parte*.

Annual herbs, with stems slightly ribbed; leaves hispid. It differs from the type subspecies by the 4-ribbed upper part of the silicula and by its cauline leaves reduced to the elliptic to ovate apical segment.

It grows in east Africa, in Ethiopia and Uganda (Fig. 8).

Examined type specimens. ETHIOPIA. Tigré: Gapdia, 1838, *Schimper 1249, Iter Abyss.* 2 (Isotypus of *Crambe abyssinica* TUB).

Selected herbarium specimens. ETHIOPIA. Abessinisches Hochland: bei Adua, x.1842, *Schimper 1918* (TUB); Abyssinia, Encheitkap, 1853, *Schimper 513* (MPU). UGANDA. Kigesi District: Muhavura Mt, 14.x.1929, *Snowden 1530* (BM); Muhavura Mt, xi.1934, *P. M. Syngé 1261* (BM).

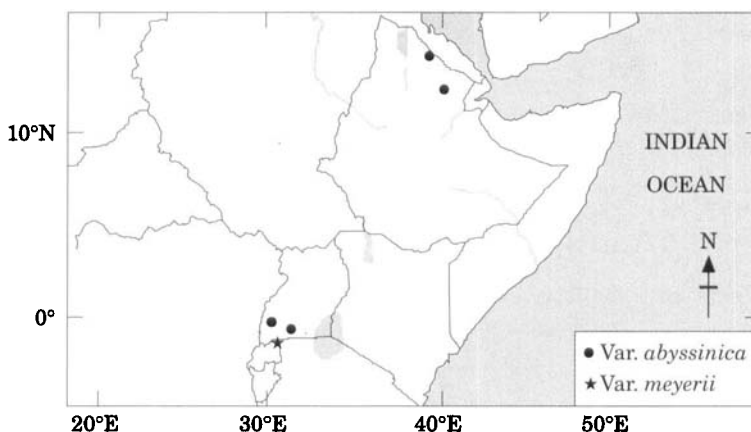


Figure 8. Distribution of *Crambe hispanica* subsp. *abyssinica* in eastern Africa.

The study of specimen *Schimper 1249* showed that its fruits are remarkably different from those of *C. kilimandscharica* with the upper part slightly 4-ribbed and smooth between ribs, with the seed not attached to the pericarp, in accordance with Fries' description.

var. *meyeri* (O. E. Schulz) **comb. nov.**

≡ *C. abyssinica* Hochst. ex R. E. Fries var. *meyeri* O. E. Schulz, *Pflanzenreich* 70-IV.105: 243 (1919), basionym.

Ind. loc. "Central-Afrika: Am Südfuß der Vulkane Muhawura und Sabinjo am Kiwu See, c. 2000 m ü. M., *Hans Meyer 681*".

— *C. hispanica sensu* Jonsell, *Bot. Not.* 129: 126 (1976), *pro parte*.

Illustration. Schulz (1919: 12, fig. 7-j).

Annual herbs with a single stem, much branched from its base; branches ribbed, glabrous or with sparse retrorse to patent hairs. Basal and median leaves with petiole 4–10 cm long, apical segment ovate, rarely cordate at base and 0–2 vestigial lateral segments. Filaments of the inner stamens with no appendage. It grows in east Africa, with the type variety (Jonsell, 1976) (Fig. 8).

Selected herbarium specimens from cultivated plants. SPAIN. Madrid: Cult. Hort. E.T.S.I. Agrónomos, U.P.M., ex sem. North Central Regional Plant Introduction Station, U.S.D.A. (U.S.A.), 20.v.1998, *Prina 1001* (MA 609111). ETHIOPIA. Alemaya, Horticulture area of College of Agriculture, 2000 m s.m., 30.x.1967, *Westphal & Stevels 2496* (VIR ex WAG). FRANCE. Hérault: Montpellier, Cult. Hort. Monsp., ex sem. Herb. Amsterdam, 23.vi.1924, *Herb. E. J. Neurat 43-177* (MPU). MOLDAVIA. Unknown locality, 1952 (VIR 10044). RUSSIA. St. Petersburg: 27.viii.1955 (VIR 10142 y 10143).

Material studied in cultivation. SPAIN. Madrid, Cult. Hort. E.T.S.I. Agrónomos, ex sem. North Central Regional Plant Introduction Station, U.S.D.A. (U.S.A.), PI 279346, "origin Ethiopia".

Crambe filiformis Jacq., *Ic. Pl. Rar.* 3: 8, Tab. 504 (1794) & *Coll.* 5: 120 (1797)
Fig. 7C, D

Ind. loc. "Crescit ad Champion River in Patagonia" (There is no doubt it is a wrong geographical location, but at the moment it is not possible to find the source of the mistake.)

≡ *Rapistrum filiforme* (Jacq.) Moench, *Meth. Suppl.*: 69 (1802).
= *C. reniformis* Desf., *Fl. Atlant.* 2: 78, Tab. 151 (1798).

Ind. loc. "In fissuris rupium Atlantis prope Tlemsen".
= *C. reniformis* Desf. var. *hispanica* Lange, in *Vidensk. Meddel., Pugill. pl. hisp.* IV: 80 (1865).

Ind. loc. "In Hispania australi hinc. inde: Jaen, in monte Castelli, Sierra Elvira, Geujar et Canales (Sierra Nevada); Malaga".
= *C. filiformis granatensis* Amo y Mora, *Fl. Iber.* 6: 642 (1878).

Ind. loc. ". . . en las márgenes del Rio Genil, inmediatas a la ciudad de Granada . . .".
= *C. filiformis* Jaq. var. *granatensis* (Amo y Mora) Willk., *Prodr. Fl. Hispanicae* 3: 754 (1880).
—*C. hispanica sensu* Ball, *Spicil. Marocc.*: 334 (1878), *non* L. (1753).

Ind. loc. "Mar. merid.-In regione media Atlantis Majoris. In convalle Amsmiz a 1500 usque 1800 m.!".

Illustrations. Jacquin (1794: tab. 504); Gómez Campo (1993: 430, lam. 160).

Perennial, 80–150 m tall with stem slightly lignified at base after the first year, branched from the base, densely hairy when young, with slightly tufted and retrorse hairs, sparsely hairy later on. Basal leaves shortly petiolate, blade lyrate-pinnatisect, 10–25 cm long, with 4–6 (8) pairs of lateral segments, some smaller and unilateral, and apical segment reniform, crenate-toothed, 5–10 cm long × 4–8 cm wide; cauline leaves few, 1.5–4 cm long, linear near the inflorescence. Inflorescence loose, each branch with apparently unilateral 10–20 flowers in anthesis at its top; pedicels glabrous, filiform, erect to spreading, 4.5–5.5 mm long; sepals linear-lanceolate, 1.8–2 mm long, narrowly albo-marginate; petals white, spatulate, 5–5.8 mm long × 2.3–2.8 mm wide; anthers oblong, 0.4–0.5 mm long. Lower part of the fruit club-shaped to filiform, 2.5–3 times as long as the upper part, hollow, sometimes with a vestigial seed; the upper part spherical, smooth, 1.8–2 mm diam., 1-seeded.

It grows in southern Spain and central and north Morocco on limestone (Fig. 9).

Selected herbarium specimens. SPAIN. Jaén: Castillo de Jaén, 28.vi.1941, *Herb. G. Albo* (MA 306197, 306198); Córdoba: alrededores de Carcabuey, 8.iv.1944, *Sesma* (MA 340479); Sevilla: Algámitas, Peñón de Algámitas, 12.xii.74, *Cabezudo & Ramos* (MAF 102597); Granada: picacho de Alcalá de los Gazules, 3.vi.1849, *E. Bourgeau* (MA 47042); Málaga: Alfarnate, Sa. de Marchamonas, 20.v.1931, *C. Vicioso* (MA 47047); Almería: Entre Berga y Alcolea, 800 m s.m., 6.iv.1983, *G. Mateo* (MA 314868); Cádiz: Algodonales, Sa. de Lijar, 19.v.1978, *Cabezudo, Rivera & Silvestre* (MAF 127393); Melilla: Barranco del Lobo, 10.v.1934, *Sennen & Mauricio 8669* (MAF 17268). MOROCCO. Tanger: Beni-Hosmar, v.1921, *C. Pau* (MA 47056); Chefchaouen: Jebel Bouhalla, 1230–1858 m s.m., 25.vii.1995, *G. Mateo & al. 7257* (SEV); Targuist: Atlas Rifain, 1250 m s.m., 20.vi.1933, *Sennen & Mauricio 8669* (BC

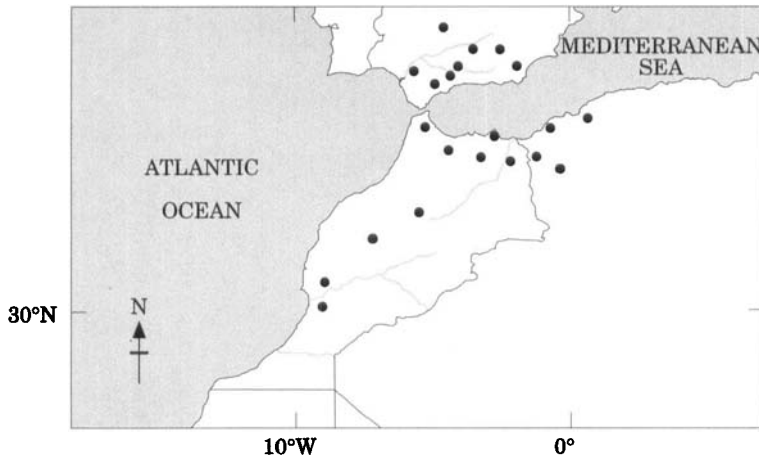


Figure 9. Distribution of *Crambe filiformis* in southern Spain and north Africa.

654993, 595899, 139362); Taza: Jebel Berkane, 1600 m s.m., 25.v.1994, *Diez, Mateos & al.* 3264, 3309 (BC, SEV, RNG); Berkane: Tafouralt, Grout des Pigeons, 20.vi.1997, *A. Prina* 217 (MA 609112); Ifrane: Atlas Medio, Vallé de Tiumliline, 1450 m s.m., 8.viii.1924, *E. Jahandiez* 910 (MA 47057); Marrakesh: 88 km de Marrakesh hacia Tiz n'Tichka, 1500 m s.m., 10.vii.1987, *Juri, Rejdali & Watson* 9180 (MA 392180); Agadir: Souk Tleta de Tasserirt, 1700 m s.m., 27.v.1980, *Fernández Casas* 3210 (BC 637708, MA 301990, MAF 116086). ALGERIA. Oran: Tlemcen, Cascades de L'Ourit. 600 m s.m., 22.vi.1932, *R. Le Cesve* 6562 (BC 139363 y 701107, MA 424818, MPU).

Material studied in cultivation. SPAIN: Cult. Hort. E.T.S.I.A., U.P.M., ex sem. USDA 372927.

Crambe kralikii Coss., *Comp. Fl. Atlant.* 2: 307 (1885).

Ind. loc. "In pascuis argilloso-calcareis, in glareosis, in dumetosis et inter frutices, in alluviis et alveis erosis, in palmetis.—Plan. O²: *Aïn Korima* (War.), *Dj. Taïlbouna!*—Sah. A⁴: *Becheraia* (Reb.), *Oued Settafa* (Vilm.), *Berrian!*, *Oued Bir!* in alluviis *Oued En-Nsa* (Reb., Vil.), *Guerrara!*, *El-Farch!*, *Besseroudj*, *Miguima* (Reb.), *Ghardaia!*.—O²: *Oued Som* (War.), *Tyout!*, *Aïn-Sefissifa!*, *Aïn-Sefra!* . . .".

Crambe kralikii subsp. *kralikii*

Fig. 10

≡ *Crambe kralikii* Coss. var. *genuina* Maire, *Bull. Soc. Hist. Nat. Afrique N.* 20: 14 (1929), invalid name.

Illustration. Cosson (1888: 89, tab. 59); Maire (1965: 359).

Perennials, with slightly swollen root. Stem glabrescent, smooth, little branched. Basal leaves with narrowly sulcate petiole 2–4 cm long and blade lyrate-pinnatifid, 15–20 cm long, dark green, apical segment oblong-lanceolate, 7–10 cm long × 3–6 cm wide, erose-toothed, sometimes with a silver spot and 2–3 smaller, irregular lateral segments; cauline leaves densely hirsute, smaller, few to none. Inflorescence

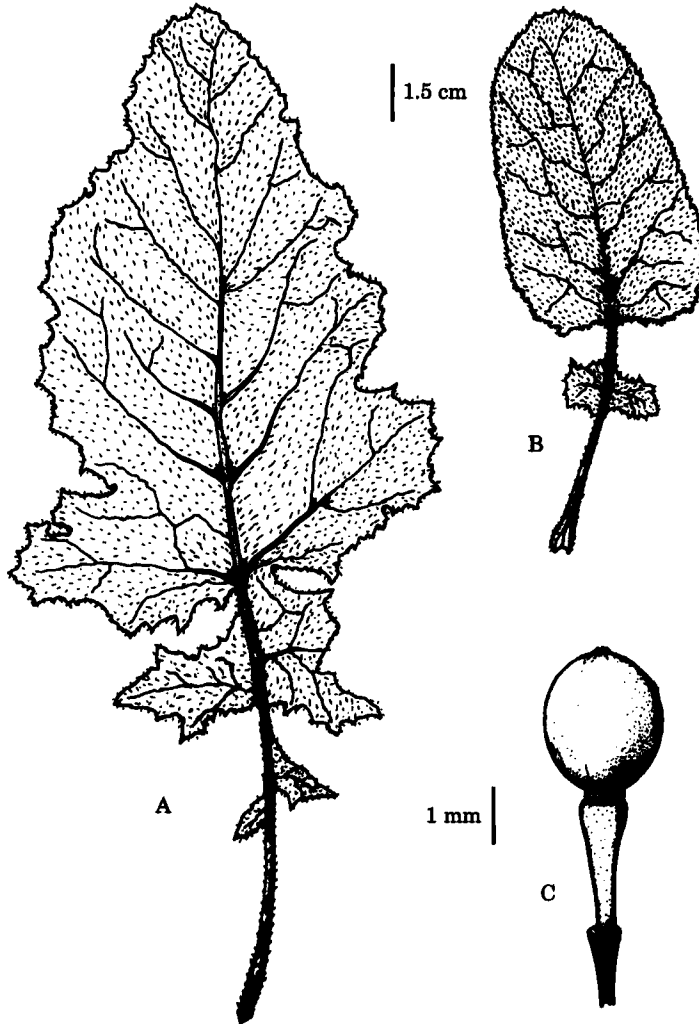


Figure 10. A–C, *Crambe kralikii* subsp. *kralikii*. A, basal leaf. B, caulinar leaf. C, fruit (A. Prina 179 MA).

loose, with slightly hanging branches; pedicels slender, glabrous, 2.5–4 mm long; sepals oblong, glabrous; petals white, 4.5–4.8 mm long, pandurate, shortly clawed; filaments of the inner stamens with an appendage on the upper portion, 0.5 mm long. Lower part of fruit fusiform, 1.8–2 mm long, aspermous; upper part globose, 2.8–3 mm diam., smooth, with one seed; seeds spherical, 1.4–1.7 mm diam., slightly reticulate.

It grows in Morocco, on the Jebel Sarhro, Jebel Bani, High Atlas and Middle Atlas, from 1000 to 2000 m and in north-west Algeria, on Tlemcen mountains and Saharian Atlas, in limestone places (Fig. 11).

Examined type specimens. ALGERIA. Ghardaia: In palmeto in ditone Mzab, 16.v.1858, L. Kralik 10 Pl. Alg. *Selectae* (MPU).

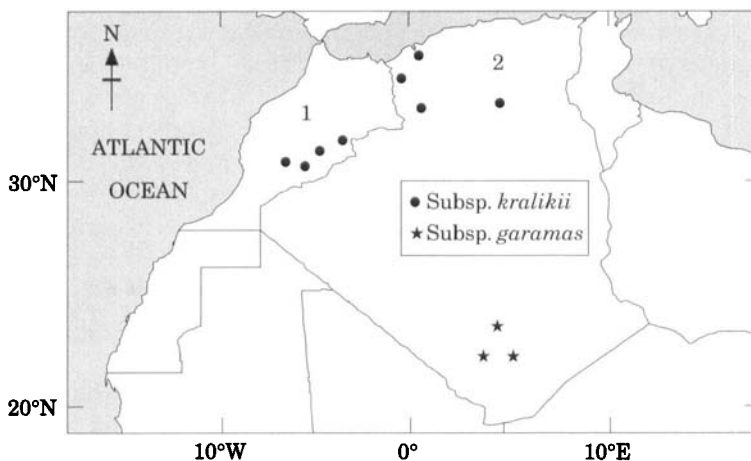


Figure 11. Distribution of *Crambe kralikii* in north-west Africa. 1, Morocco. 2, Algeria.

Selected herbarium specimens. MOROCCO. Fez: Midelt, 15 km west-south-west von Missouri bei Ksabi, 1000 m s.m., 14.iv.1987, *Bayón, Oberprieler & Vogt* 5334 (MA 517333); Marrakech: prope Demnat, Imni n'Ifri, 1160 m s.m., 4.vi.1980, *Fernández Casas* 3352 (BC 637706, MA 225664); Ouarzazate: Grand Atlas, Jebel Toubkal, 1900 m s.m., 23.vi.1939, *Maire & Weiller* 478 *Iter Maroc*. (MPU); Oued Dra, Tamdaghl, 30 km north-west de Ouarzazate, 26.iii.1963, *Mathez* 329 (MPU); Anezal, 1620 m s.m., 15.vi.1982, *Fernández Casas* 6937 (MA 308737); Gorges du Dades, 1750 m s.m., 1.vi.1985, *Fernández Casas* 9694 (BC 813187); Jebel Bani, cerca de Tazenaht, 1000 m s.m., 11.vi.1996, *A. Prina* 179 (MA 609113); Jebel Sarhro, 10.iv.1939, *Peltier* (MPU); Antiatlas, inter Tiouine et Tachokeht, 1600 m s.m., 9.v.1932, *Maire Iter Maroc*. (MPU); Tafraoute: Antiatlas, inter Tiffermit et Tizi-Amber, 1300 m s.m., 19.iv.1935, *Maire et Wilczek* (MPU). ALGERIA. Ain Sefra: Ain Sefra, v.1856, *Cosson* (LE); Djebel Araira, 1300–1500 m s.m., 29.v.1918, *Maire* (MPU); Ghardaia: Mzab, without date, *Latourneux* (MPU); Ghardaia, sub palmis sat frequens, 3.v.1897, *L. Chevallier* (MPU); Orán: Soud Ouranaise, Beni Ounif, v.1922, *D'Alleizette* (BC 139360, MA 47073).

Herbarium specimens from cultivated plants. SPAIN. Madrid: Cult. Hort. E.T.S.I. Agrónomos, ex sem. Banco de Semillas U.P.M. GC-1104-67, 10.iii.1998, *A. Prina* 500 (MA 609115).

Material studied in cultivation. SPAIN. Madrid: Cult. Hort. E.T.S.I. Agrónomos, ex sem. Banco de Semillas U.P.M. GC-1104-67, 10.iii.1998.

Crambe kralikii subsp. *garamas* (Maire) D. Podlech, *Mitt. Bot. Staatssaml. Munchen* 17: 475 (1981).

≡ *Crambe kralikii* var. *garamas* Maire, *Bull. Soc. Hist. Nat. Afrique N.* 20: 14 (1929), basionym.

Ind. loc. "Hab. in lapidocis graniticis nec non vulcanicis montium Ahaggar Saharæ centralis, ad alt. 1450–2800 m".

Perennials, basal leaves with the lateral segments confluent with the apical one. Filaments of the inner stamens with a very long and conspicuous appendage.

Endemic of southern Algeria, where it grows in the Ahaggar mountains (Fig. 11).

Examined type specimens. [Maire (1929, 1965) never mentioned any particular specimen.

However, all specimens cited here were collected by Maire, in the area described in the protologue, and during a short period (less than one month), one year before the publication of the name, so that they are all considered syntypes of var. *garamas* Maire.] ALGERIA. Tamanrasset: Ahaggar, Atakor-n-Ahaggar, Tigendaoui, in lapidocis graniticis secus amnen, 2000 m, 12.iii.1928, *Maire 161 Iter Saharicum* (MPU-Maire); Ahaggar, Atakor-n-Ahaggar, in lapidocis phonoliticis ad radices montem Asekrem, 2500 m, 19.iii.1928, *Maire 165 Iter Saharicum* (MPU-Maire); Ahaggar, Imarera, in rupestribus basalticus secus amnen, 1950 m, 24.iii.1928, *Maire 166 Iter Saharicum* (MPU-Maire); Ahaggar, Tikertekart, in lapidocis graniticis, 2000 m, 3.iv.1928, *Maire 163 Iter Saharicum* (MPU-Maire); Ahaggar, Ideles, in rupestribus basalticus secus amnen, 1450–1500 m, 6.iv.1928, *Maire 164 Iter Saharicum* (MPU-Maire).

Selected herbarium specimens. ALGERIA. Tamanrasset: Ahaggar, au dessus du 2000 m s.m., without date, *Lhote*. (BC 139361, ex Herb. Université d'Alger); Sahara Central, Ahaggar, *Laperrine* (MPU).

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