

Notes on four alien naturalized weeds in Morocco: extended distribution and new record

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Abstract

This contribution deals with the record of four alien naturalized plants in Morocco due to field surveys conducted in 2023 and 2024, with special emphasis on weeds occurring in farmlands (agricultural regions of Chaouia, Gharb, Haouz, Loukkos, Sous, and Tadla). Among these reported plants, three are here presented as new national distributional records namely, *Euphorbia heterophylla* L., *E. nutans* Lag. (*Euphorbiaceae*) and *Malvastrum coromandelianum* (L.) Garcke subsp. *coromandelianum* (*Malvaceae*) whereas *Cardiospermum microcarpum* (Kunth) Blume (*Sapindaceae*) is here reported for the first time in the country. Photographic evidence, distribution map, and taxonomic notes are provided for each taxon. In addition, voucher herbarium specimens were prepared and deposited at the national herbarium of the Scientific Institute in Rabat (RAB).

Key words. xenophytes, weed survey, new records, flora, North Africa.

Resumen

Notas sobre cuatro hierbas alóctonas naturalizadas en Marruecos: Distribución extendida y un nuevo registro

Esta contribución trata del registro de cuatro plantas exóticas naturalizadas en Marruecos gracias a estudios de campo realizados en 2023 y 2024, con especial énfasis en las malezas presentes en las tierras de cultivo (regiones agrícolas de Chaouia, Gharb, Haouz, Loukkos, Sous y Tadla). Tres especies se reportan como nuevos registros de distribución nacional: *Euphorbia heterophylla* L., *E. nutans* Lag. (*Euphorbiaceae*) y *Malvastrum coromandelianum* (L.) Garcke subsp. *coromandelianum* (*Malvaceae*); en tanto que *Cardiospermum microcarpum* (Kunth) Blume (*Sapindaceae*) se registra por primera vez para el país. Se proporcionan evidencias fotográficas, mapas de distribución y notas taxonómicas para cada taxón. Además, se prepararon ejemplares de herbario de referencia, que se depositaron en el herbario nacional del Instituto Científico de Rabat (RAB).

Palabras clave: xenófitas, estudio de malezas, nuevos registros, flora, norte de África.



Several invasive alien plants have been found in Morocco over the past three decades (e.g. Tanji & Taleb, 1997; Homrani-Bakkali & Peltier, 2020; Verloove *et al.*, 2022; Chambouleyron, 2023; Sukhorukov *et al.*, 2023, 2025; Tanji, 2020, 2023a, 2023b; Khamar & El Bakhouch, 2024; Khamar *et al.*, 2021, 2022, 2024a, 2024b). These xenophytes were unintentionally introduced due essentially to human activities (incl. trade, tourism, farming). In continuation with previous records of aliens introduced into Morocco, this contribution presents the distribution maps and color photographs of four alien plant taxa that have been collected from cultivated fields, roadsides and nurseries surroundings in 2023 and 2024. The nomenclature follows POWO (2025). Voucher herbarium specimens were prepared and deposited at the national herbarium of the Scientific Institute in Rabat (RAB) (Herbarium acronym following Thiers, 2025). Some of these taxa were not yet indicated in Morocco, according to our bibliographical survey (e.g. Taleb & Bouhache, 2006; Taleb, 2015; Ben-Ghabrit *et al.*, 2019).

Cardiospermum microcarpum Kunth, Nov. Gen. Sp. 5: 104. 1821.

≡ *Cardiospermum halicacabum* var. *microcarpum* (Kunth) Blume, Rumphia 3: 185. 1847.

MOROCCO: Ksar El Kebir, 35°0'34"N 005°53'12"W, 30 m a.s.l., sugarcane fields, 5-10-2024, A. Tanji s.n. (RAB114810); Aneur Chamalia, Dar Gueddari, 34°22'14"N 006°9'13" W, sugarcane fields, 10-10-2024, A. Tanji (field observation); Ksar Bjir, Ksar El Kebir, 34°58'58"N 005°55'17"W, 15 m a.s.l., corn fields, 7-10-2024, A. Tanji (field observation); Laouamra, Larache, 35°6'21"N 006°8'22"W, 34 m a.s.l., from irrigated avocado, 5-10-2024, A. Tanji (field observation).

C. microcarpum is native to tropical and subtropical regions of America, but widely spread in Africa, Asia, and Australasia (e.g. Ferrara, 2018; Suresh *et al.*, 2023; Smithi *et al.*, 2024). In North Africa, this taxon is indicated in Egypt by Boulos (2000) and has been more recently observed also in Algeria and Tunisia (F.Z. Sekkal pers. com.), although it has yet to be reported in Morocco. It is a weed in many countries, e.g. Greece (Arianoutsou *et al.*, 2010), Albania (Barina *et al.*, 2014), South Africa (Gildenhuys *et al.*, 2013), Mexico (Vibrans, 1998), Australia (WOA, 2025), USA (Rankins *et al.*, 2005).

In October 2024, plants of *C. microcarpum* were collected from irrigated avocado, corn, and sugarcane fields near Ksar El Kebir, Laouamra, and Dar El Gueddari (Figures 1 and 2).

From other *Cardiospermum* species, *C. microcarpum* is distinguished by its climber habit, stem slender, glabrous, up to 2 m tall, clinging with inflorescence tendrils (or sometimes erect stem, only 20–30 cm tall). Leaves biternate, triangular in outline with stipules, petioles 3–4 cm. Flower milky-white, (2.5-)3–4 mm wide; lower and upper sepals 2–3 mm long, lateral sepals 1-1.5 mm long. Capsule subglobose or turbinate-trigone, inflated with air, 1.5–2.0 cm wide, ± pubescent, with emarginate apex, 2.5–3.5 cm (including the stipe) × 2.5–3.4 cm, stipe ± 1 mm long. Seed 4–6 mm diam, black, shiny, aril 3–5 × 2.0–2.5 mm (see more in Friedmann, 2011).

Euphorbia heterophylla L. Sp. Pl.: 453 (1753)

MOROCCO: Bni Ayat, Beni Mellal, 32°14'23"N 006°39'29"W, 442 m a.s.l., irrigated crops citrus, 3-9-2024, A. Tanji s.n. (RAB114807); Sidi Jaber, Beni Mellal, 32°20'24"N 006°25'52"W, 463 m a.s.l., irrigated crops citrus, 2-9-2024, A. Tanji s.n. (field observation); Bradia, Beni Mellal, 32°24'51"N 006°29'42"W, 445 m a.s.l., irrigated crops citrus, 2-9-2024, A. Tanji (field observation); Bradia, Beni Mellal, 32°25'19"N 006°30'17"W, 442 m a.s.l., irrigated crops citrus, 2-9-2024, A. Tanji (field observation); Bradia, Beni Mellal, 32°25'24"N 006°30'15"W, 442 m a.s.l., irrigated crops olive, 2-9-2024, A. Tanji s.n. (RAB114808); Sidi Aissa Ben Ali, Beni Mellal, 32°20'17"N 006°34'44"W, 427 m a.s.l., irrigated crops pepper, 4-9-2024, A. Tanji s.n. (RAB114809); Hel Merbaa, Beni Mellal, 32°21'35"N 006°35'27"W, 421 m a.s.l., irrigated crops pepper, 4-9-2024, A. Tanji (field observation); Bradia, Beni Mellal, 32°24'43"N 006°32'48"W, 427 m a.s.l., irrigated crops corn, 11-8-2024, A. Tanji (field observation); Sidi Jaber, Beni Mellal, 32°20'13"N 006°25'47"W, 466 m a.s.l., irrigated crops sesame, 26-8-2024, A. Tanji (field observation); Oulad Ouchih, Ksar El Kebir, 35°2'16"N 005°54'35"W, 452 m a.s.l., sugarcane fields, 5-10-2024 A. Tanji (field observation).

E. heterophylla is native to North, Central, and South America (POWO, 2025; EPPO, 2025). According to Calero *et al.* (2023), it is commonly recognized as a significant weed that impacts crops such as soybeans, beans, and corn, and it is one of the most invasive weed species, especially in tropical and subtropical regions of America. Besides, it is considered a summer annual weed in Egypt (Ghani *et al.*, 2020), Israel (Kigel *et al.*, 1992), India (Araf *et al.*, 2009) and Tunisia (El Mokni, 2023). In Morocco, it was first reported by Tanji and Taleb (1997), who noted that its introduction was likely due to contaminated agricultural seeds.

From August to October 2024, *E. heterophylla* has been found in various irrigated crops (citrus, corn, olive, pepper, sesame, sugarcane,) near Beni Mellal, and Ksar El Kebir (Figures 1 and 2). One to 10 plants at various stages (from seedling to fruiting) were found at each site.

From a morphological perspective (Dressler, 1961; Turner, 1999), *E. heterophylla* may superficially resemble *E. cyathophora* Murray, a species indigenous to the midwestern and southeastern United States, Mexico, the West Indies, and northern South America (POWO, 2025). However, *E. heterophylla* differs from *E. cyathophora* in its stems and petioles, which are often markedly sparse and pilose. Pilose (vs. glabrous in *E. cyathophora*), stem cross section rounded (vs. angled), leaves dull green (vs. glossy green), floral bracts green or basally pale, sometimes purple spotted but never basally red (vs. green, usually basally red), cyathial gland stipitate, clavate, opening circular (vs. cyathial gland sessile to substipitate, bilabiate, the opening narrowly oblong). The capsule is broadly ovoid and $\pm$ pubescent (compared to the capsule in *E. cyathophora*, which is depressed-globose to ellipsoid and glabrous), while the seeds are coarsely and bluntly tuberculate and angular (in contrast to the seeds of *E. cyathophora*, which are finely and sharply tuberculate and not angular).

Euphorbia nutans Lag., Gen. Sp. Pl. : 17. 1816.

$\equiv$ *Chamaesyce nutans* (Lag.) Small, Fl. S.E. U.S.: 712 . (1903).

$\equiv$ *Tithymalus nutans* (Lag.) Samp. In Anais Fac. Sci. Porto 17: 45. (1931).

MOROCCO: Oulad Ouchih, Ksar El Kebir, 35°2'16"N 005°54'35"W, 52 m a.s.l., irrigated crops of sugarcane, 5-10-2024, A. Tanji s.n. (RAB114811); Sidi Jaber, Beni Mellal, 32°20'13"N 006°25'47"W, 466 m a.s.l., irrigated crops of sesame, 26-8-2024, A. Tanji s.n. (RAB114812); Ain Nzagh, Settati, 32°58'3"N 007°37'39"W, 393 m a.s.l., nursery, 8-10-2024, A. Tanji s.n. (RAB114813).

E. nutans is originally found in North America, spanning from Canada to northern South America (FNA, 2025; POWO, 2025). It typically grows in areas like roadsides, forest edges, and disturbed sites (Steinmann *et al.*, 2016). As a neophyte species, it has extended its range into many temperate regions globally (POWO, 2025), becoming a common naturalized plant and sometimes invasive in Europe, while also establishing itself in North Africa, Asia, Australia, and South America (Vázquez Pardo & Márquez García, 2018).

In Morocco, *E. nutans* is indicated by Dobignard & Chatelain (2011), without precise information on the locality(-ties) where it has been found. In August and October 2024, we detected the species in various irrigated crops (sesame, sugarcane, nursery) near Beni Mellal, Settati, and Ksar El Kebir (Figures 1 and 2). Several plants were observed at each site, and plants were at various stages, from seedling to fruiting.

E. nutans is differentiated from its closely related species within the *Euphorbia* sect. *Anisophyllum*, particularly *E. hypericifolia* L. (a species recently identified in Morocco, Khamar *et al.* 2024), by its stems sparsely to moderately pilose to villous or with short, incurved hairs, pubescence often concentrated at nodes and distally (hairs occasionally in 2 bands along opposite sides of stem); leaf blades usually sparsely to moderately pilose, especially toward base, sometimes glabrous; seeds finely and irregularly wrinkled or with indistinct shallow, rounded cross ridges (see also Steinmann *et al.*, 2016).

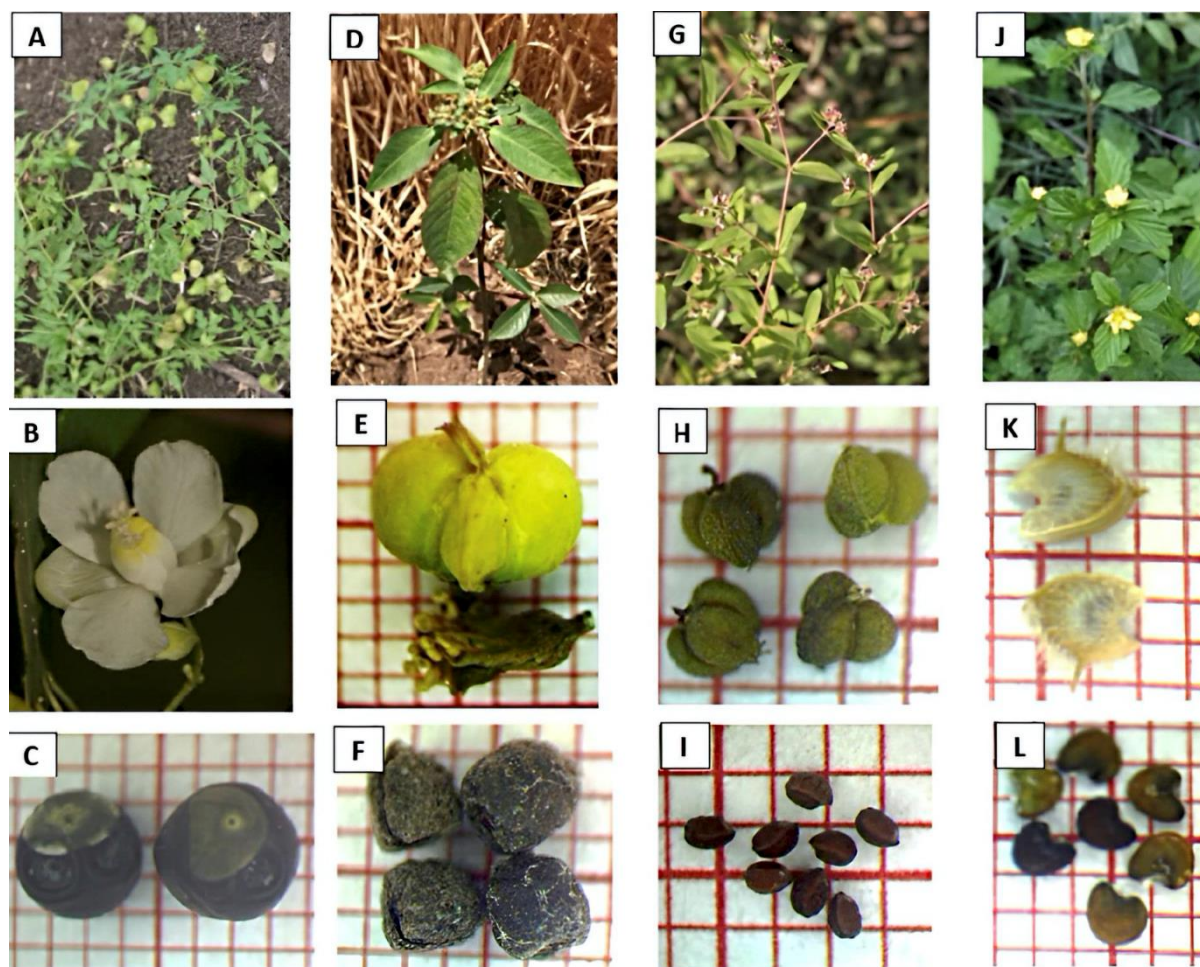


Figure 1. *Cardiospermum microcarpum* in Morocco: A) aspect and port ; B) flower ; C) seeds. *Euphorbia heterophylla* in Morocco: D) general habit; E) capsule; E) seeds. *Euphorbia nutans* in Morocco: G) general habit; H) capsules; I) seeds. *Malvastrum coromandelianum* subsp. *coromandelianum* in Morocco: J) general habit; K) mericarps; L) seeds.

Figura 1. *Cardiospermum microcarpum* en Marruecos: A) aspecto y porte; B) flor; C) semillas. *Euphorbia heterophylla* en Marruecos: D) hábito general; E) cápsula; F) semillas. *Euphorbia nutans* en Marruecos: G) porte general; H) cápsulas; I) semillas. *Malvastrum coromandelianum* subsp. *coromandelianum* en Marruecos: J) hábito general; K) mericarpos; F) semillas.

Malvastrum coromandelianum* (L.) Garcke subsp. *coromandelianum

MOROCCO: Souihla near Marrakech, 31°28'5"N 008°12'8"W, 399 m a.s.l., under cultivated olive trees, 5-9-2024, A. Tanjis. s.n. (RAB114814); Agadir, 30°25'11"N 009°36'59"W, 1 m a.s.l., on the edge of the street, 20-9-2024, A. Tanji s.n. (RAB114815).

M. coromandelianum is native to North and South America (POWO, 2025). It is a weed in various crops elsewhere, e.g. South Africa (Foxcroft *et al.*, 2003), Burkina Faso (Traoré & Maillet, 1992), Cyprus (Hadjikyriakou *et al.*, 2004), Mexico (Leopardi-verde *et al.*, 2021), India (Saxena & Rao, 2018), China (Huang *et al.*, 2011), United Arab Emirates (Sakkir *et al.*, 2022).

Plant samples were collected under a Canary Island date palm tree (*Phoenix canariensis* H. Wildpret) on June 10, 2024 in the « Marina » seaport of Agadir, and under cultivated olive trees on September 5, 2024 in Souihla near Marrakech (Figures 1 and 2). In both locations, plants were at the flowering and fruiting stages.

In most references about *M. coromandelianum*, there is no mention of infraspecific taxa. Although, Hill (1982) and Otto & Verloove (2016) distinguished 2 subspecies:

1. Annual or perennial herb with several main stems to about 1 m tall. Flowers solitary in leaf axils, somewhat apically congested with age. Mature carpels with an apical awn <1 mm and two dorsal spines. Adaxial leaf surface usually covered with simple or 4-rayed stellate hairssubsp. *coromandelianum*

1'. Mostly perennial herb with single main stem up to 1.5 m tall. Flowers in congested axillary racemes. Mature carpels with an apical awn >1 mm and two dorsal spines. Adaxial leaf surface usually covered with bilateral 4-rayed stellate hairs subsp. *capitatospicatum* (Kuntze) S.R. Hill

This contribution revealed the presence of one new naturalized alien plant recently discovered in Morocco, and provides new data for three other aliens whose data were very scattered. Native to the Americas and tropics, these 4 aliens were probably introduced with crop seed, agricultural machinery, and/or vehicles transporting livestock or agricultural products from Europe. The verification of *Euphorbia heterophylla*'s presence in Morocco lends credence to the idea of this species' local naturalization. *Cardiospermum microcarpum* Kunth and *Malvastrum coromandelianum* (L.) Garcke subsp. *coromandelianum* behave as annuals to perennials (therophytes to climbing hemicryptophytes), and can be spread by seeds and root or stem cuttings. The complexity of the life-forms of these two taxa would allow them to rapidly invade crops. The record of new weeds naturalizing and invading more and more agricultural field crops in Morocco indicates that the country (as elsewhere in the Mediterranean) needs more botanical explorations, especially within ruderal floristic communities.

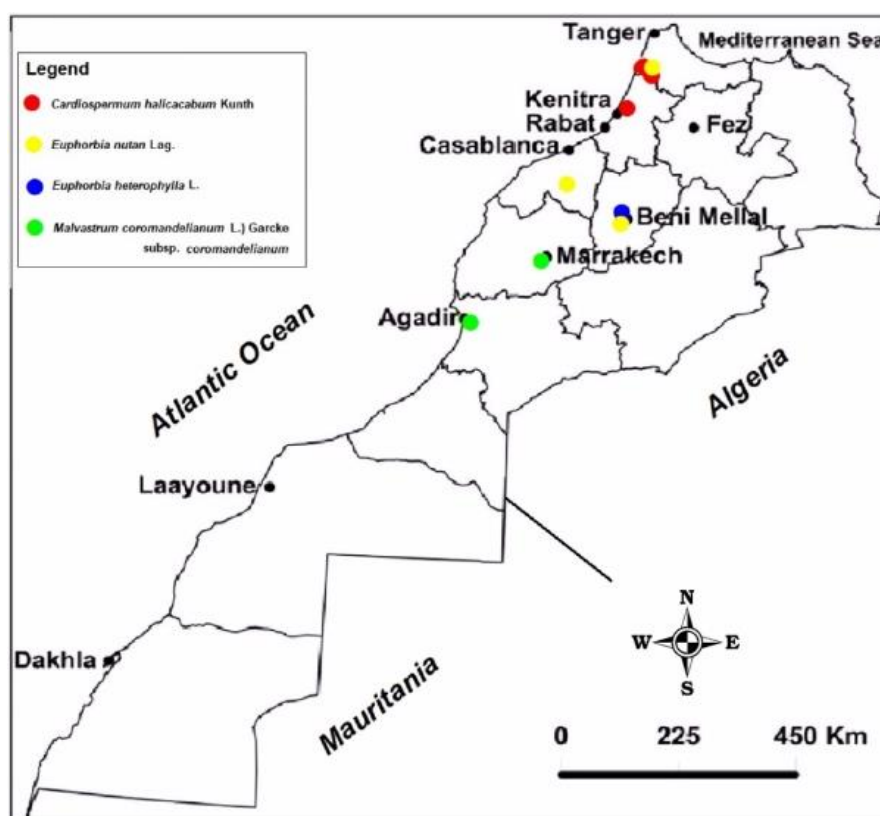


Figure 2. Geographical distribution of the four plant taxa in the map of Morocco.

Figure 2. Distribución geográfica de los cuatro taxones en el mapa de Marruecos.

Conflict of interest

The authors declare that they have not conflicts of interest relevant to the content of this manuscript.

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