

Notes on six endemic or rare species of *Euphorbia* subg. *Esula* (Euphorbiaceae) in Iran

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Notes on six endemic or rare species of *Euphorbia* subg. *Esula* (*Euphorbiaceae*) in Iran

Abstract

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In the course of the revision of the genus *Euphorbia* in Iran, *E. grisophylla* and *E. sogdiana* are reported as new for the country. *E. erythradenia*, *E. malleata* and *E. spartiformis* are confirmed as rare localised endemics and an epitype is selected for the name *E. spartiformis*. *E. polycaulis* is shown to be the correct name for the more widespread Iranian endemic so far known as *E. decipiens* and *E. sparsiglandulosa* is sunk into the synonymy of this species. All species but *E. polycaulis* are illustrated and the following information is given for each of them: synonymy, description, delimitation from similar species, distribution and specimens examined.

Additional key words: *Euphorbia* sect. *Helioscopia*, *Euphorbia* sect. *Paralias*, taxonomy, endemism

Introduction

The number of accepted species in the mega-diverse and world's second largest genus *Euphorbia* exceeds 2000 species (Govaerts & al. 2000; Bruyns & al. 2006). The genus occupies various habitats in both temperate and tropical regions with the exception of the arctic region. Its members show the whole range of habits from small ephemerals over various forms of herbaceous annuals and perennials to shrubs and trees, many of them being succulents. SW Asia is one of its main centres of diversity. Most species there belong to subgenus *Esula*, comprising herbaceous annuals and perennials (Boissier 1879; Parsa 1949; Prokhanov 1974; Rechinger 1964; Rechinger & Schiman-Czeika 1964; Radcliffe-Smith 1980, 1982, 1986; Collenette 1999; Govaerts & al. 2000). In temperate regions, *E. subg. Esula* is a very complex group, distributed mainly in the northern hemisphere with about 500 species (Bruyns & al. 2006; Riina & Berry 2011). Middle Asia and the Iranian highlands are main centres of diversity of *E. subg. Esula* sect. *Paralias*, to which in

Iran almost all rare, endangered, endemic and complex species belong.

Rechinger & Schiman-Czeika (1964) in *Flora Iranica* gave 65 *Euphorbia* species for Iran. Their treatment of the *Euphorbiaceae* in this noble work of 178 parts, edited by the outstanding Austrian botanist Karl Heinz Rechinger (1963–2010) and covering the Iranian highlands (Iran, Afghanistan and parts of Iraq, Azerbaijan, Turkmenistan and Pakistan), belongs to the first six parts, which include no descriptions. Their treatment of *Euphorbia* contains a good number of localised, but sometimes doubtful species, based on very limited material. About 50 years later, the number of *Euphorbia* species in Iran has increased to more than 90 species. Several species were newly described or recorded for Iran (Ponert 1973; Mobayen 1984; Akhane 2004; Djavadi & al. 2006; Nasseh & al. 2006; Pahlevani 2006; Sajedi & al. 2006; Pahlevani 2007; Pahlevani & Riina 2011; Pahlevani & al. 2011; Pahlevani & Akhane 2011, Pahlevani & Mozaffarian 2011), but some names turned out to be

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synonyms and some reports to be erroneous (Pahlevani 2007; Pahlevani & Riina 2011; Pahlevani & al. 2011). As a further part of the results of our revisionary work on *Euphorbia* in Iran, the present contribution deals with six rare or endemic species of *E.* subg. *Esula* in Iran.

Material and methods

The study is based on the investigation of herbarium specimens from the following herbaria in Iran: IRAN, TARI, FUMH (abbreviations according to Thiers 2008+), the personal herbarium of H. Akhani (herb. Akhani), currently housed at the Department of Plant Sciences, University of Tehran, and the herbarium of the Research Center of Agricultural and Natural Resources Kurdistan, Sanandaj. Our revisionary work is further based on the critical evaluation of the following core publications on the subject: Boissier (1862, 1879), Khan (1964), Rechinger & Schiman-Czeika (1964), Prokhanov (1974), Radcliffe-Smith (1982), Govaerts & al. (2000) and Geltman (2005). The distribution maps were generated using the computer program DMAP (Morton 2009).

Notes on species of *Euphorbia* subg. *Esula* in Iran

1. *Euphorbia grisophylla* new for Iran (*E.* sect. *Helioscopia*)

Euphorbia grisophylla M. S. Khan in Notes Roy. Bot. Gard. Edinburgh 25: 94. 1964 ≡ *Tithymalus grisophyllus* (M. S. Khan) Soják in Čas. Nár. Mus., Odd. Přír. 140: 172. 1972.

Sparingly pubescent-pilose to subglabrous perennial herbs, up to 90 cm high; *stems* several, usually unbranched, arising from a woody rootstock, scaly at base. *Cauline leaves* ovate-oblong, lanceolate or broadly ovate,

3–5.5 × 1–2.5 cm, truncate, cuneate or sometimes subcordate at base, subsessile, apex acute or obtuse, margin entire, pinnately veined. *Terminal rays* 5; *axillary rays* 0–4. *Ray leaves* ovate, broadly ovate or ovate-rhombic, 2–3 × 1.5–2.5 cm, truncate at the base, apex acute or sometimes cuspidate, margin entire to undulate. *Raylet leaves* ovate-deltoid to suborbicular, truncate or shal-

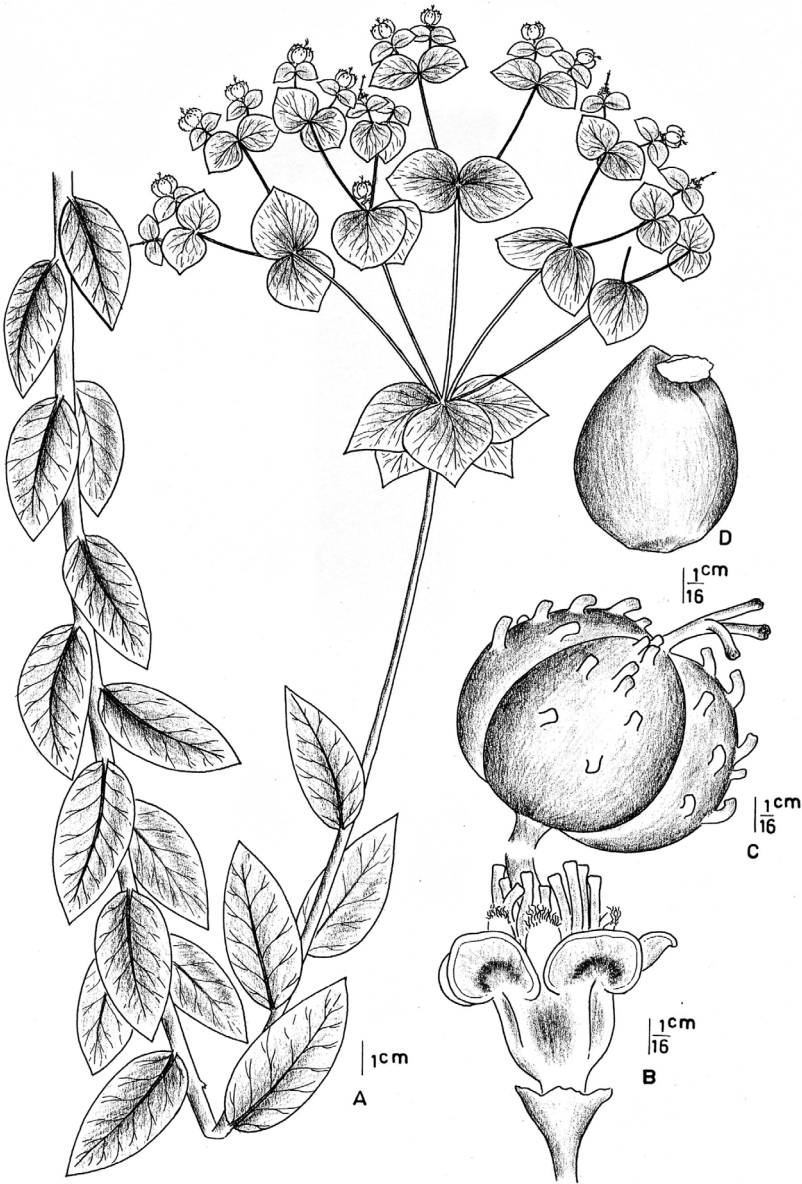


Fig. 1. *Euphorbia grisophylla* – A: habit; B: cyathium; C: fruit; D: seed. – After Maroofi 55797 (IRAN); drawing by M. Mehranfard.

Table 1. Diagnostic characters of *Euphorbia grisophylla* and *E. macrocarpa*.

Species	Cauline leaves	Terminal rays	Axillary rays	Fruit surface	Fruit size	Seed size
<i>E. grisophylla</i>	ovate-oblong to broadly ovate	5	0–4	at base smooth but upper surface warty	5–6.5 mm in diameter	up to 3 mm wide
<i>E. macrocarpa</i>	lanceolate to oblong	5–7	numerous	completely warty	8–10 mm in diameter	4 mm wide

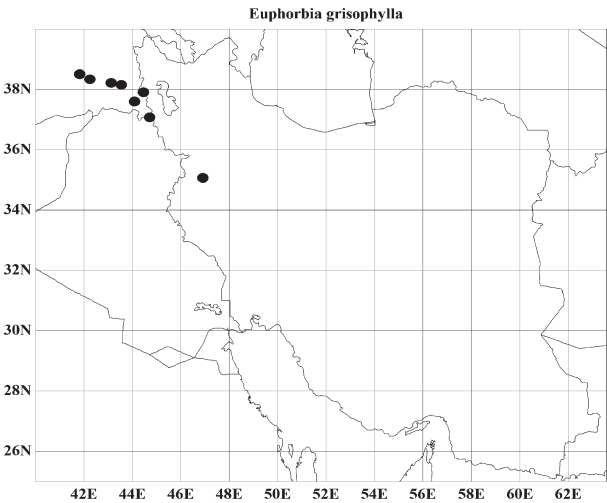


Fig. 2. Geographical distribution of *Euphorbia grisophylla*.

lowly cordate at base, entire, apex cuspidate and yellowish. *Cyathia* lobes oblong-lanceolate; glands elliptic and rounded, brownish. *Capsules* trilobate, 5–6.5 mm in diameter, glabrous, covered with conical-cylindrical warts, at base often smooth (without any warts). *Seeds* broadly ovoid, 3.5–4 mm long and 2.5–3 mm wide, smooth, grey-brownish, rarely flecked blackish; caruncles widely conical, yellowish, 0.5 mm long. – Fig. 1. – Flowering and fruiting: May–July.

Distribution and habitat. — The species has been known hitherto from E Turkey only and is here reported for the first time from W Iran, occurring in the northern Zagros Mts (Fig. 2). It grows on dry rocky igneous and limestone slopes and screes, at altitudes of 1800–3000 m.

Delimitation. – *Euphorbia grisophylla* shows a close affinity to *E. macrocarpa*. The most important diagnostic characters of both species are given in Table 1.

Specimen examined. — IRAN: KURDISTAN: Sanandaj to Kamiaran, Avalan Mt., 7.6.2009, *Maroofi* 55797 (IRAN).

2. *Euphorbia sogdiana* new for Iran (*E. sect. Paralias* subsect. *Conicocarpae*)

Euphorbia sogdiana Popov in Trudy Turkestansk. Nauchn. Obshch. 1: 38. 1923 ≡ *Tithymalus sogdianus* (Popov) Prokh., Consp. Syst. Tithymalus As. Med.: 156. 1933
= *Euphorbia longicorniculata* Kitam. in Acta Phytotax. Geobot. 17: 133. 1958 ≡ *Tithymalus longicorniculatus* (Kitam) Soják in Čas. Nár. Mus., Odd. Přír. 140: 173. 1972
= *Euphorbia volkii* Rech. f. in Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl. 100: 53. 1963 ≡ *Tithymalus volkii* (Rech. f.) Soják in Čas. Nár. Mus., Odd. Přír. 140: 177. 1972.

Glabrous, glaucous perennial herbs, 25–60 cm high. *Cauline leaves* ovate-lanceolate, elliptic or elliptic-oblong, 2–4 × 0.5–1.5 cm, truncate, dilated-triangular and sometimes slightly amplexicaul at base, sessile, apex obtuse, subacute and cuspidate, margin entire or denticulate in upper half and cartilaginous, coriaceous with 3–5 distinct palmate veins. *Terminal rays* 3–5, 5–12 cm long; *axillary rays* 3–5. *Ray leaves* broadly ovate or oblong-lanceolate, 1.5–3.5 × 0.8–2 cm, truncate at base, apex obtuse to subacute or short cuspidate, margin crenulate at least in upper half. *Raylet leaves* orbicular or ovate-rhombic, truncate or shallowly cordate at base, margin entire or slightly denticulate in upper half, apex cuspidate. *Cyathia* lobes oblong-lanceolate; glands crescent, brownish, bi- to multicornute, yellowish. *Capsules* trilobate, 3–4 mm in diameter, smooth. *Seeds* ovoid, 3–3.5 mm long (without caruncle), pitted, grey to brown; caruncles orbicular-conical, yellowish, 0.5 mm long. – Fig. 3. – Flowering and fruiting: late May–July.

Distribution. — According to Rechinger & Schiman-Czeika (1964, under *Euphorbia longicorniculata* and *E. volkii*), Prokhanov (1974), Govaerts & al. (2000) and Geltman (2005), the species has been known so far from SE Uzbekistan, Tajikistan and Afghanistan. Based on specimens in IRAN and FUMH, its presence also

Table 2. Diagnostic characters of *Euphorbia sogdiana*, *E. microsciadia* and *E. kopetdaghi*.

Species	Cauline leaves	Venation	Ray length	Gland shape	Gland horn
<i>E. sogdiana</i>	ovate-lanceolate to elliptic-oblong, obtuse, subacute and cuspidate	3–5 disctinctive palmate veins	5–12 cm	crescent	pectinate or two long-horned
<i>E. microsciadia</i>	oblong-elliptic, obtuse to subacute	without distinctive veins or with 1–3 indisctinctive palmate veins	less than 5 cm	trapeziform	hornless or two short-horned
<i>E. kopetdaghi</i>	oblong-linear, acuminate or cuspidate	1–3 distinctive palmate veins	less than 5 cm	crescent	two long-horned or pectinate

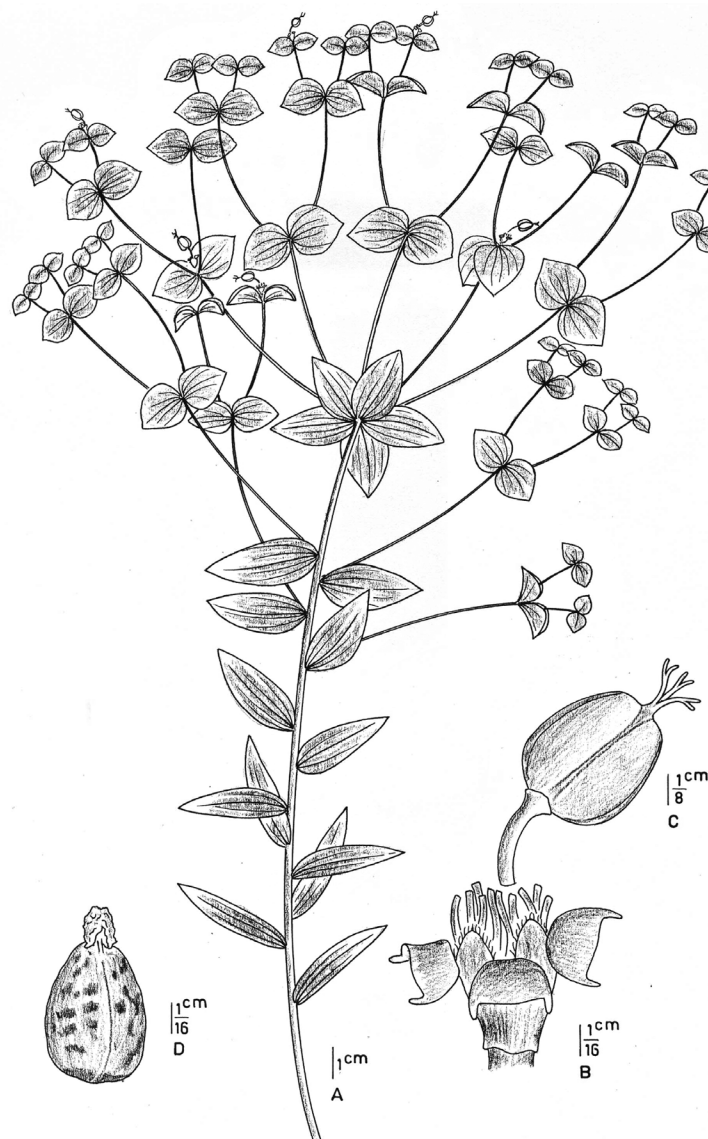


Fig. 3. *Euphorbia sogdiana* – A: habit; B: cyathium; C: fruit; D: seed. – After Joharchi 33743 (FUMH); drawing by M. Mehranfard.

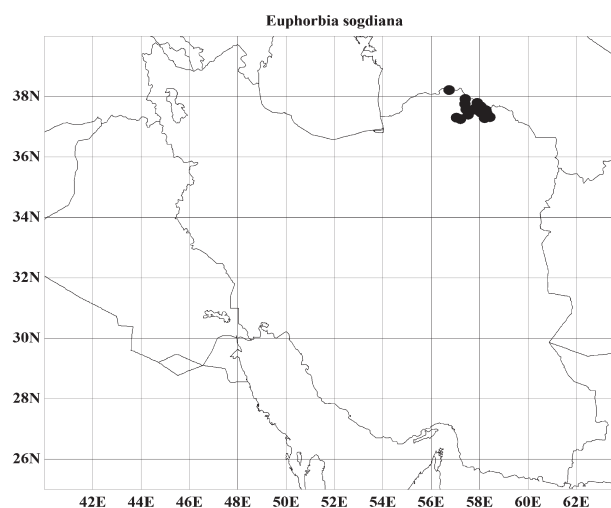


Fig. 4. Geographical distribution of *Euphorbia sogdiana* in Iran.

in the Kopetdagh region in NE Iran (Fig. 4) is here reported for the first time. It grows on dry mountain slopes at altitudes of 600–2200 m.

Delimitation. — *Euphorbia microsciadia* and *E. kopetdaghi* are the closest relatives to *E. sogdiana* in Iran. The main differences between these three species are given in Table 2.

Euphorbia kopetdaghi is confined to the Kopetdagh range (NE Iran, NW Afghanistan and S Turkmenistan) and conspecific with *E. aellenii* Rech. f., described from the northern part of Khorasan (Rechinger 1951) as was first stated by Geltman (2005) and has been confirmed by our examination of an isotype (Khorasan, Ghuchan to Alamli, Rechinger 4759, IRAN 5078) and other specimens, including newly collected ones. *E. microsciadia* is rather widespread, ranging from N and W Iran across Afghanistan to W Pakistan.

Specimens examined. — IRAN: NORTHERN KHORASAN: Shirvan, Loojli, 16.6.2002, Djavadi & Sadeghi 47397 (IRAN); Bojnourd, Gifan to Ghareh-Lor, 24.5.1995, Faghihnia & al. 25561 (FUMH); Bojnourd, between Ayerghaye and Sookhli, 12.6.2001, Joharchi 33743 (FUMH); Ghuchan, Faruj to Oughaz-Kohne, Ghale-Safa Mt., 23.6.1997, Faghihnia & Zangooei 29351 (FUMH); Shirvan, Oughaz, Gharizab Mt., 14.7.1997, Hojjat & Zangooei 29660 (FUMH); 66 km E of Bojnourd, 15.5.1966, Pabot 47369 (IRAN); SE of Bojnourd, Chenaran village, Zo chenaran, 27.5.2008, Joharchi & Zangooei 40419 (FUMH); NE of Bojnourd, between Naveh & Shohaday-e Naveh, 29.5.2007, Memariani & Zangooei 39037 (FUMH); SW of Bojnourd, Hesar-Shughan road, Salouk protected area, 1.6.2008, Joharchi & Zangooei 40590 (FUMH); Shirvan to Bajgiran, Alkhas, 9.6.1998, Faghihnia & Zangooei 31473 (FUMH); N of Ghuchan, Rahvard to Asiblagh, 10.6.1998, Faghihnia & Zangooei 31514 (FUMH); N of Faruj, Najaf-abad, near graveyard, 1.6.2009, Memariani & Zangooei 42749 (FUMH); N of Shirvan, Saveli to Loojli, 19.6.1995, Faghihnia & Zangooei 25872 (FUMH); N of Faruj, N of Hesarandof, 7.6.2009, Memariani & Zangooei 42847 (FUMH); S of Bojnourd, Rakhtian to Hesar, 4.7.1993, Faghihnia & Zangooei 23545 (FUMH).

3. *Euphorbia spartiformis* (*E. sect. Paralias*)

Mobayen (1984) described a conspicuous but apparently rare new species of *Euphorbia* from the Zagros

Mts, which forms spinescent cushions, based on a specimen without fruits and seeds. Having studied additional material, also with fruits and seeds, we here designate an epitype and provide an amended description, an illustration (Fig. 5) and information on the affinities of this narrowly distributed endemic.

Euphorbia spartiformis Mo-bayen in Iran. J. Bot. 2: 160. 1984. – Holotype: Iran, Hormozgan, Bandar-abbas, Ghotb-abad, 1120 m, *Foroughi 1172* (TARI); epitype (here designat-ed): Iran, Hormozgan, 55 km Haji-abad to Bandar-abbas, Tange-Zagh, Kuh-e Tunnel, 1250–1350 m, 27°55'26"N, 55° 58'10"E, 13.3.2009, *Pahlevani & al. 55156* (IRAN).

Glabrous, glaucous, intricate-ly-branched, spinescent and caespitose subshrubs to 50 cm height. *Stems* woody with white lamelliform scales, older branches usually terminating in forked obtuse and rather thick spines. *Leaves* elliptic-ovate, 4–6 × 1–3 mm, glabrous, atten-uate at base, sessile-subsessile, apex acute-subacute, margin entire, without conspicuous veins. *Rays* with falsely dichotomous branching. *Ray and raylet leaves* similar to cauline leaves. *Cyathia* lobes ovate-lanceolate and 2–3-dentate; glands crescent, dark reddish or rarely brownish with two rather thick and light reddish

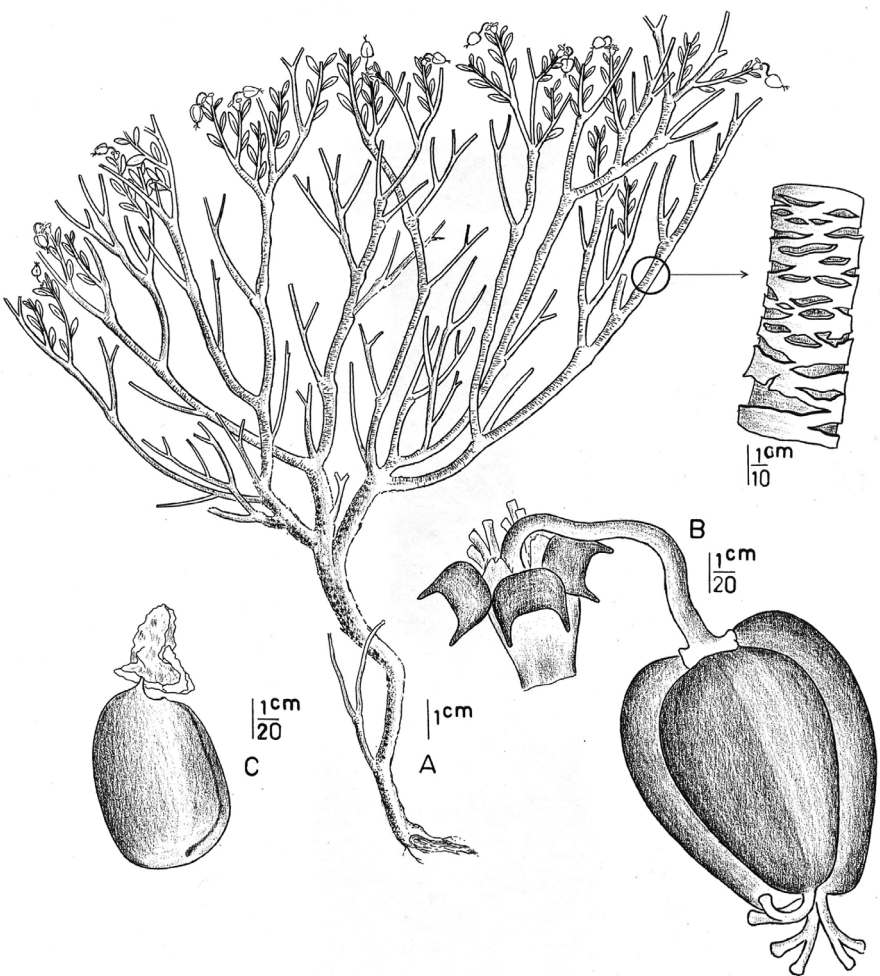


Fig. 5. *Euphorbia spartiformis* – A: habit; B: cyathium & fruit; C: seed. – After *Iranshahr & Termeh 18096* (IRAN); drawing by M. Mehranfard.

horns. *Capsules* trilobate, pyramid shaped, 3–4 mm long, smooth with long pedicel. *Seeds* ovoid, 2 mm long (with-out caruncles), slightly pitted or rather smooth, grey to brown; caruncles conical, 0.5–0.75(–1) mm long. – Fig. 5. – Flowering and fruiting: February–March.

Table 3. Diagnostic characters of *Euphorbia spartiformis*, *E. acanthodes* and *E. erinacea*.

Species	Branches	Bark	Leaves	Glands	Capsules	Caruncles	Habitat
<i>E. spartiformis</i>	obtuse and thick spines	lamellate	without any conspicuous veins, glabrous	dark red or brown	smooth	0.5–0.75(–1) mm long	chasmophyte
<i>E. acanthodes</i>	acute and gradually thin spines	rather smooth, yellow	1–3 prominent palmate veins, papillose	yellow-ochreous	smooth	1.2–1.5 mm long	eremophilous on gypsum hills
<i>E. erinacea</i>	acute and so intricate spines	smooth, yellowish-brown	midrib only, glabrous	reddish	warty	less than 0.5 mm long	eremophilous

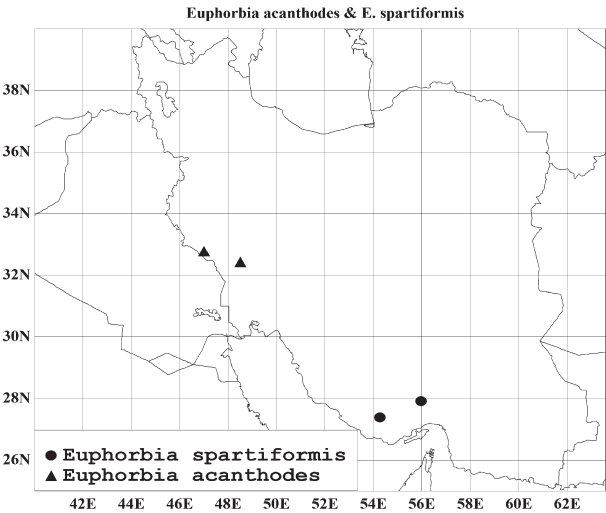


Fig. 6. Geographical distribution of *Euphorbia spartiformis* and *E. acanthodes*.

Distribution and habitat. — The species is restricted to the SE edge of the Zagros Mts (Fig. 6), where it occurs as a chasmophyte at altitudes of 600–1350 m. Co-occurring species are *Euphorbia larica*, *E. granulata*, *Andrachne telephioides*, *A. aspera*, *Convolvulus acanthocladus*, *Ebenus stellata*, *Salvia mirzayanii*, *Cocculus hirsutus*, *Helianthemum cinereoflavescens*, *H. lippii*, *Zhumeria majdae*, *Otostegia persica*, *O. aucheri*, *Platychaete aucheri*, *Centaurea wendelboi*, *Capparis cartilaginea*, *Amygdalus eburnea* and *Caralluma tuberculata*.

Delimitation. — *Euphorbia spartiformis* is morphologically rather similar to *E. acanthodes* Akhani and *E. erinacea* Boiss. & Kotschy, endemic species of Iran and Syria, respectively. The differences between these three species are given in Table 3.

The distribution area of the very rare *Euphorbia acanthodes* is situated in the provinces of Ilam and Khuzestan (a new locality: Khuzestan, road of Dez dam, 14 km E of Andimeshk, *Pabot 1088*, TARI) (Fig. 6) and is ecologically very different to that of *E. spartiformis*: *E. acanthodes* is restricted to gypsum hills along the border of Iran with Iraq. The vegetation of these hills consists of several gypsophilous species, in particular *Pteropyrum naufelum*, *Gypsophila linearifolia*, *Diplotaxis harra*, *Albraunia fugax*, *Crepis aspera*, *Onobrychis gypsicola*, *Scabiosa leucactis*, *Cleome glaucescens*, *Convolvulus*

gonocladus. The only common species in the habitats of *E. spartiformis* and *E. acanthodes* is the widespread *Helianthemum lippii* (Akhani 2004).

A phylogenetic analysis of DNA sequence data (Rii-na & al., in prep.) revealed that in spite of their morphological similarities *E. spartiformis* and *E. acanthodes* are no close relatives, being nested in two different clades.

Further specimens examined. — IRAN: HORMOZGAN: Bandar-abbas to Sirjan, Ghotb-abad, Kuh-e Tunnel, 9.3.1971, *Iranshahr & Termeh 18096* (IRAN); Bandar-abbas to Hagi-abad, 5.5.1961, *Pabot 18193* (IRAN). — FARS: Lar to Bastak, Anveh, 1.3.1971, *Iranshahr & Termeh 47917* (IRAN).

4. *Euphorbia erythradenia* recollected (*E. sect. Paralias* subsect. *Conicocarpae*)

Euphorbia erythradenia Boiss., Diagn. Pl. Orient., ser. 1, 7: 92. 1846. ≡ *Tithymalus erythradenius* (Boiss.) Klotzsch & Garcke in Abh. Königl. Akad. Wiss. Berlin 1859: 86. 1860.

- = *Euphorbia heteradena* Boiss. & Buhse in Nouv. Mém. Soc. Imp. Naturalistes Moscou 12: 198. 1860, nom illeg.
- = *Euphorbia erythradenia* var. *obovata* Boiss. in Candolle, Prodr. 15(2): 152. 1862.

Glabrous, glaucous perennial herbs, up to 20(–28) cm high. *Cauline leaves* elliptic-linear, 5–10(–14) × 1–3 mm, without distinguished veins, truncate at base, sessile, apex obtuse or subacute, margin entire. *Terminal rays* 1–3, 1.5–3(–5) cm long; *axillary rays* 0–3. *Ray leaves* elliptic-linear, 5–10 × 1–3 mm, truncate at base, apex obtuse to subacute, margin entire. *Raylet leaves* small ovate, truncate at base, margin entire, apex obtuse or cuspidate. *Cyathia* lobes oblong-lanceolate; glands trapeziform, dark reddish, with 2 wide horns, ochreous. *Capsules* trilobate, 3 mm in diameter, 4–5 mm long, smooth. *Seeds* ovoid, 2–2.5 mm long (without caruncles), pitted, grey to brown; caruncles conical, 1 mm long. – Fig. 7. – Flowering and fruiting: May–June.

Distribution and habitat. — Among the few collections cited by Rechinger & Schiman-Czeika (1964) for *Euphorbia erythradenia*, the two from Kerman Province (Bornmüller 4694 and 4695) were misidentified and actually belong to *E. gypsicola* Rech. f. & Aell., as was stat-

Table 4. Diagnostic characters of *Euphorbia erythradenia* and *E. gedrosiaca*.

Species	Height of plant	Cauline leaves	Rays number	Rays length	Bifurcation	Glands
<i>E. erythradenia</i>	14–20(–25) cm	5–10 × 1–3 mm	1–2(–3)	1.5–3(–5) cm	one time	dark reddish
<i>E. gedrosiaca</i>	25–55 cm	11–20 × 3–7 mm	(2–)3–4	3–16 cm	2–3 times	yellowish-brown

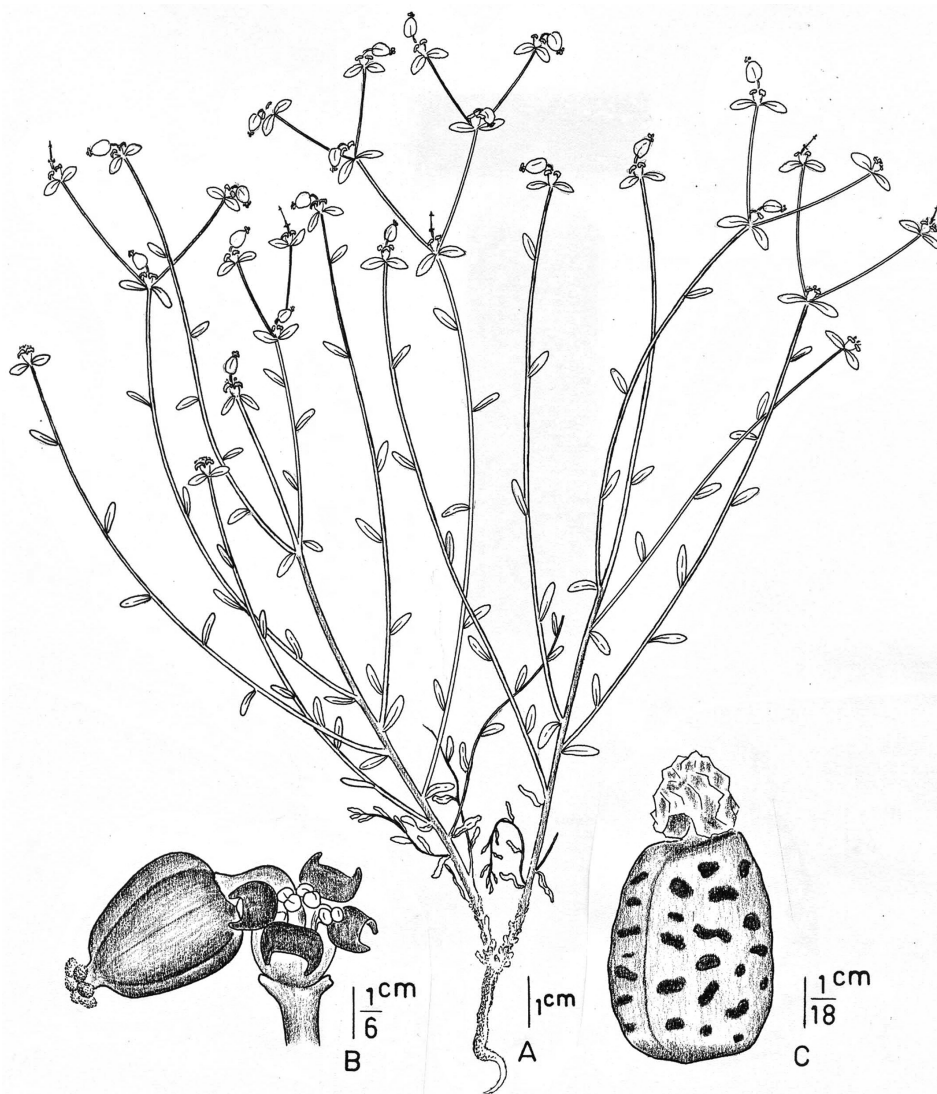


Fig. 7. *Euphorbia erythradenia* – A: habit; B: cyathium & fruit; C: seed. – After Pahlevani & Bahramishad 53337 (IRAN); drawing by M. Mehranfard.

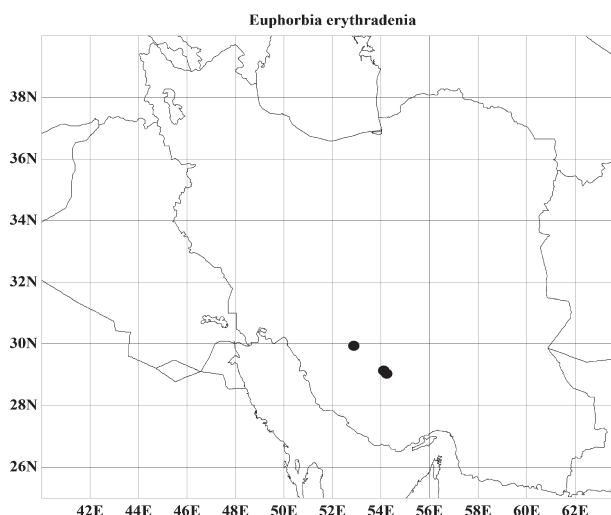


Fig. 8. Geographical distribution of *Euphorbia erythradenia*.

ed already by Geltman (2005). The cited collection of Strauss from Arak probably represents *E. gedrosiaca*. We have not traced any collection of *E. erythradenia* in Iranian herbaria and the two collections made by the first author in 2009 (see below), may perhaps be the only ones made since a century.

The species has a very scattered occurrence in the southern Zagros Mts (Fig. 8). It grows on dry, stony slopes, at altitudes of 1900–2500 m.

Delimitation. — *Euphorbia erythradenia* is most closely related with *E. gedrosiaca*, which is distributed in central and SE Iran. The most important diagnostic characters for these species are shown in Table 4.

Specimens examined. — IRAN: FARS: 20 km from Neyriz to Estahban, 27.5. 2009, Pahlevani & Bahramishad 53336 (IRAN); Estahban, Eij Mt., 28.5. 2009, Pahlevani & Bahramishad 53337 (IRAN).

5. *Euphorbia malleata* (*E. sect. Paralias* subsect. *Coniocarpae*)

Euphorbia malleata Boiss. in Candolle, Prodr. 15(2): 152. 1862 ≡ *Tithymalus malleatus* (Boiss.) Soják in Čas. Nár. Mus., Odd. Přír. 140: 173. 1972.

Glabrous, glaucous perennial herbs with yellowish stems, up to 80 cm high. *Cauline leaves* lanceolate, 3–7 × 0.5–2 cm, truncate at base, sessile, apex acute, margin entire, palmately veined. *Terminal rays* (6–)7–12(–15); *axillary rays* 0–15. *Ray leaves* ovate-oblong or ovate-deltoid, 1–3 × 0.5–2.5 cm, truncate or slightly cordate at base, apex acute and cuspidate, margin entire. *Raylet leaves* ovate-rhombic to ovate-deltoid, cordate at base, margin entire and cartilaginous, apex cuspidate. *Cyathia lobes* oblong; glands crescent, ochreous, 2-horned. *Capsules* trilobate, 3–4 mm in diameter, intensely keeled,

glabrous. *Seeds* oblong, 2.7–3 mm long (without caruncles), pitted, grey to brown; caruncles conical-cylindrical, 1 mm long. – Fig. 9. – Flowering and fruiting: July–August.

Distribution and habitat. — *Euphorbia malleata* is endemic to a rather small area of the central plateau and part of Zagros Mts in the provinces of Esfahan and Yazd (Fig. 10), where it occurs on dry stony slopes and foothills at altitudes of 1900–3200 m.

Rechinger & Schiman-Czeika (1964) quote only three collections of this endemic species. Almost half a century later, despite rather intensive collecting activities by Iranian botanists, still only rather few collections are known, confirming the limited occurrence of this species.

Specimens examined. — IRAN: ESFAHAN: Kashan, Komow, Kargaz Mt., 7.5.1984, *Moussavi & Tehrani* 44564 (IRAN); Kashan, Abyaneh, Tordal, 7.7.1984, *Moussavi & Tehrani* 44540 (IRAN); c. 25 km SW of Natanz, foothills of the southern slopes of Karkas Mt., 24.7.2003, *Akhani* 17148 (herb. Akhani); Kashan, Abyaneh, 30.7.1976, *anonymous* 47928 (IRAN); Natanz, 30 km from old road of Natanz to Esfahan, Targh village, 26.7.2009, *Pahlevani & Bahramishad* 53353 (IRAN); Kashan, Ghamsar, Ghohroud, 25.8.2010, *Pahlevani & Bahramishad* 54893 (IRAN); Ardestan to Murcheh-Khort, Tar, 27.5.1974, *Iran-shahr* 17996 (IRAN); Natanz, Keshe village, Karkas Mt., 26.7.2009, *Pahlevani & Bahramishad* 53334 (IRAN); Mount Kar-

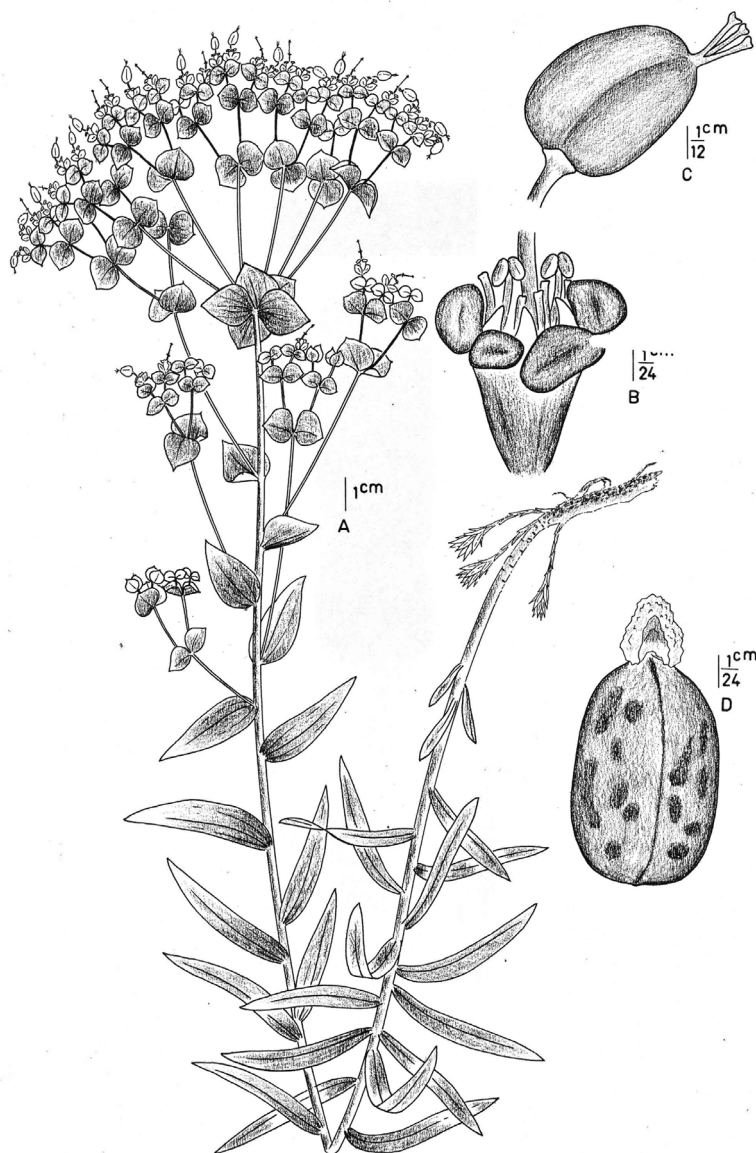


Fig. 9. *Euphorbia malleata* – A: habit; B: cyathium; C: fruit; D: seed. – After *Pahlevani & Bahramishad* 53353 (IRAN); drawing by M. Mehranfar.

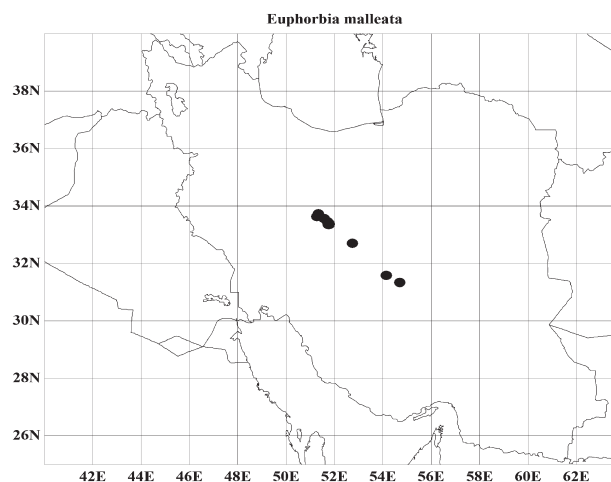


Fig. 10. Geographical distribution of *Euphorbia malleata*.

kas, N of Targh, 15.5.1974, *Wendelbo & Foroughi* 11455 (TARI); Kouhpaye to Nain, 21.4.1948, *Rechinger & al.* 17734 (IRAN). – YAZD: Shirkuh, 20 km SSW of Taft, 25.5.1977, *Aryavand & al.* 1379 (TARI).

6. *Euphorbia polycaulis* (E. sect. *Paralias* subsect. *Coniocarpae*)

Euphorbia polycaulis Boiss. & Hohen. [“*polycaula*”] in Boissier, *Diagn. Pl. Orient.*, ser. 1, 12: 112. 1853 ≡ *Tithymalus polycaulis* (Boiss. & Hohen.) Klotzsch & Garcke in *Abh. Königl. Akad. Wiss. Berlin* 1859: 97. 1860. – Syntypes: [Iran], prope pagum Asadbar in partibus occidentalibus m. Elburs, 8 Jul 1843, *T. Kotschy* 465, *Pl. Pers. bor. ed. R.F. Hohenacker* 1846 (G-BOIS [n.v.], P 00568293, P 00568294, W [n.v.]

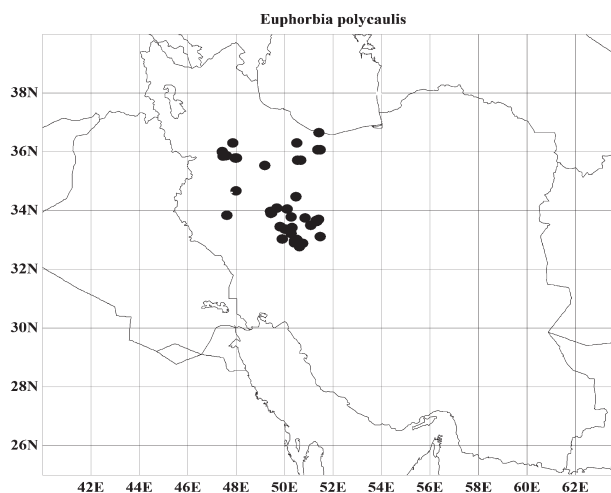


Fig. 11. Geographical distribution of *Euphorbia polycaulis*.

- = *Euphorbia decipiens* Boiss. & Buhse in Nouv. Mém. Soc. Nat. Mosc. 12: 197. 1860 ≡ *Tithymalus decipiens* (Boiss. & Buhse) Soják in Čas. Nár. Mus., Odd. Přír. 140: 171. 1972.
- = *Euphorbia ornata* Stapf in Denkschr. Akad. Wiss. Wien, Math.-Nat. Kl. 51: 312. 1886.
- = *Euphorbia sparsiglandulosa* Ponert in Preslia 45: 361. 1973, **syn. nov.**
- [– *Euphorbia splendida* Mobayen, Rostanihaye Iran 2: 124. 1979, nom. nud.]

Euphorbia polycaulis was omitted by Rechinger & Schiman-Czeika (1964), while Govaerts & al. (2000) quote it in the synonymy of *E. decipiens*. Our studies corroborate that both are conspecific, but the correct name of the species is *E. polycaulis*, because this validly published name has priority over *E. decipiens*.

Euphorbia polycaulis is a rather complex, polycarpic species with high morphological plasticity. A comprehensive description and an illustration of the species were given by Pahlevani (2007 under the name *E. decipiens*).

After close examination of *Euphorbia sparsiglandulosa* Ponert (1973), an endemic described from Gachsar, situated in Mazandaran Province, it was found that this is also conspecific with *E. polycaulis*. *E. sparsiglandulosa* was separated from *E. decipiens* by characters such as the number of rays, size and shape of stem leaves as well as seed colour (Ponert 1973), all being subject of considerable variation and therefore of little taxonomic value.

Erect to subascending glabrous perennial herbs. *Cauline leaves* lanceolate to obovate or oblanceolate-linear. *Rays* 10–30, once or twice bifid. *Capsules* ovate-conical, 4–5 mm long, smooth. *Seeds* 2.5–3 mm long (without caruncle), greyish to whitish (depending on growth stage), malleate and foveolate; caruncles sessile,

0.75–1 mm long, flattened-conical. – Flowering and fruiting: May–July.

Distribution and habitat. — *Euphorbia polycaulis* is a species endemic to N, W and C Iran (Fig. 11). It occurs on mountain slopes on limestone at altitudes of 1900–3200 m.

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References

- Akhani H. 2004: A new spiny, cushion-like *Euphorbia* (*Euphorbiaceae*) from South-West Iran with special reference to the phytogeographic importance of local endemic species. – Bot. J. Linn. Soc. **146**: 107–121.
- Boissier E. 1862: *Euphorbiaceae* L. – Pp. 3–188 in: Candolle A. de (ed.), *Prodromus systematis naturalis regni vegetabilis* **15(2)**. – Paris: Masson et filii.
- Boissier E. 1879: *Euphorbia* L. – Pp. 1082–1136 in: Boissier E. (ed.), *Flora orientalis* **4**. – Basel: Georg.
- Bruyns P. V., Mapaya R. J. & Hedderson T. 2006: A new subgeneric classification for *Euphorbia* (*Euphorbiaceae*) in southern Africa based on ITS and *psbA-trnH* sequence data. – *Taxon* **55**: 397–420.
- Collenette S. 1999: Wild flowers of Saudi Arabia. – Riyadh: National Commission for Wildlife Conservation and Development (NCWCD).
- Djavadi S. B., Mehrshahi D. & Baniaméri V. 2006: *Euphorbia serpens*, first report from Iran. – *Rostaniha* **7(1)**: 73–74.
- Geltman D. V. 2005: Species of the genus *Euphorbia* section *Paralias* subsection *Conicocarpae* (*Euphorbiaceae*) in the flora of Middle Asia and Iranian highlands. – Bot. Zhurn. **91**: 1097–1106 [in Russian].
- Govaerts R., Frodin D. & Radcliffe-Smith A. 2000: World checklist and bibliography of *Euphorbiaceae* (with *Pandaceae*) **2**. – Kew: Royal Botanic Gardens.
- Khan M. S. 1964: Taxonomic revision of *Euphorbia* in Turkey. – Notes Roy. Bot. Gard. Edinburgh **25**: 71–161.
- Mobayen S. 1984: Four new species from Iran. – Iran. J. Bot. **2**: 159–166.
- Morton A. 2009: DMAP for windows. Distribution map software 7.3. – Berkshire.
- Nasseh Y., Joharchi M. R. & Zehzad B. 2006: Two new records of the genus *Euphorbia* (*Euphorbiaceae*) for

- the flora of Iran. – Iran. J. Bot. **12(1)**: 78–81.
- Pahlevani A. H. 2006: *Euphorbia prostrata*, a noteworthy new record from the flora of Iran. – Rostaniha **7(2)**: 157–158.
- Pahlevani A. H. 2007: Notes on some species of the genus *Euphorbia* in Iran. – Rostaniha **8(2)**: 89–103.
- Pahlevani A. H. & Akhiani H. 2011: Seed morphology of Iranian annual species of *Euphorbia* (*Euphorbiaceae*). – Bot. J. Linn. Soc. **167**: 212–234.
- Pahlevani A. H. & Mozaffarian V. 2011: *Euphorbia iran-shahri* (*Euphorbiaceae*), a new endemic species from Iran. – Adansonia, ser. 3, **33**: 93–99.
- Pahlevani A. H. & Riina R. 2011: A synopsis of *Euphorbia* subgen. *Chamaesyce* Raf. (*Euphorbiaceae*) in Iran. – Ann. Bot. Fenn. **48**: 304–316.
- Pahlevani A. H., Geltman D. V. & Riina R. 2011 [in press]: Taxonomic revision of *Euphorbia* subsect. *Myrsiniteae* Boiss. for the flora of Iran. – Ann. Bot. Fenn. **48**.
- Parsa A. 1949: *Euphorbiaceae*. – Pp. 1206–1284 in: Parsa A. (ed.), Flore de l'Iran **4**. – Tehran: Tehran University.
- Ponert J. 1973: A new species of *Euphorbia* from Iran. – Preslia **45**: 361–363.
- Prokhanov Y. I. 1974: *Euphorbia* L. – Pp. 233–377 in: Shishkin B. K. & Bobrov E. G. (ed.), Flora SSSR **14**. – Moskva & Leningrad [English translation; Jerusalem: Israel Program of Scientific Translations, 1974.
- Radcliffe-Smith A. 1980: *Euphorbia* L. – Pp. 327–362 in: Townsend C. C. & Guest E. (ed.), Flora of Iraq **4.1**. – Baghdad: Ministry of Agriculture and Agrarian Reform.
- Radcliffe-Smith A. 1982: *Euphorbia* L. – Pp. 571–629 in: Davis P. H. (ed.), Flora of Turkey and the East Aegean Islands **7**. – Edinburgh: Edinburgh University.
- Radcliffe-Smith A. 1986: *Euphorbia* L. – Pp. 88–164 in: Nasir E. & Ali S. I. (ed.), Flora of Pakistan **172**. – Karachi: University of Karachi.
- Rechinger K. H. 1951: *Euphorbiaceae* et *Ranunculaceae* novae iranicae. – Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl. **9**: 217–227.
- Rechinger K. H. 1964: *Euphorbia* L. – Pp. 414–423 in: Rechinger K. H. (ed.), Flora of Lowland Iraq. – Weinheim: J. Cramer.
- Rechinger K. H. & Schiman-Czeika H. 1964: *Euphorbia* L. – Pp. 8–48 in: Rechinger K. H. (ed.), Flora iranica **6**. – Graz: Akademische Druck- und Verlagsanstalt.
- Riina R. & Berry P. E. (coordinators) 2011: *Euphorbia* Planetary Biodiversity Inventory database. – Published at <http://www.tolkin.org/projects/72>.
- Sajedi S., Iranshahr M. & Mamnouee E. 2006: A new species of *Euphorbia* for Iran. – Rostaniha **7(1)**: 73.