

Euphorbia iranshahri (Euphorbiaceae), a new endemic species from Iran

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ABSTRACT

KEY WORDS
Euphorbiaceae,
Euphorbia,
endemic,
Iran,
Zagros Mountains,
new species.

During the joined study on recently collected specimens and herbarium sheets belonging to the genus *Euphorbia* (Euphorbiaceae), a new species, *Euphorbia iranshahri* Pahlevani, was reported and illustrated as endemic from the Zagros Mountains in Iran. This species is morphologically distinct from *E. microsciadia* Boiss. by possessing 6-8 rays and ray-leaves, subulate cyathia lobes longer than (or sometimes equal to) anthers, sharp-keeled capsules and smooth seeds.

RÉSUMÉ

MOTS CLÉS
Euphorbiaceae,
Euphorbia,
endémique,
Iran,
montagnes du Zagros,
espèce nouvelle.

Euphorbia iranshahri (Euphorbiaceae), une nouvelle espèce endémique d'Iran. Lors de l'étude conjointe de matériel récemment collecté et de spécimens d'herbier appartenant au genre *Euphorbia* (Euphorbiaceae), une espèce nouvelle, *Euphorbia iranshahri* Pahlevani, a été signalée et illustrée comme endémique des montagnes du Zagros en Iran. Cette espèce se distingue morphologiquement de *E. microsciadia* Boiss. par ses 6 à 8 rayons inflorescentiels axillés par autant de feuilles, par les lobes des cyathes plus longs (ou parfois de même longueur) que les anthères, par ses capsules fortement carénées, ainsi que par ses graines lisses.

INTRODUCTION

The genus *Euphorbia* L. is widely distributed throughout the Old and New World, in both temperate and tropical regions. This cosmopolitan genus, with more than 2000 species, occurs on all continents except Antarctica (Govaerts *et al.* 2000).

Euphorbia comprises trees, shrubs, woody perennials, perennial herbs and many kinds of prostrate, ascending, erect and ephemeral annuals. Species of *Euphorbia* grow in a wide range of habitats, including coastal sands, sandy dunes, rocky slopes, gypsum hills, gravelly deserts; along riversides, as weed in cultivated areas and on saline soils from sea level to more than 4000 m altitude. Iran is a major center of diversity for *Euphorbia* subgenus *Esula* Pers. On the basis of detailed taxonomic studies and information gathered from the literature, there are more than 90 *Euphorbia* species, with approximately 16 endemic species in Iran, most of which belong to subgenus *Esula* (Boissier 1866, 1879; Muschler 1912; Rechinger & Schiman-Czika 1964; Rechinger 1964; Radcliffe-Smith & Tutin 1968; Prokhanov 1974; Radcliffe-Smith 1980, 1982, 1986; Mobayen 1984; Mouterde 1986; Collenette 1999; Govaerts *et al.* 2000; Akhani 2004; Nasseh & Joharchi 2004; Nasseh *et al.* 2006; Djavadi *et al.* 2006; Pahlevani 2006, 2007; Pahlevani & Riina in press; Pahlevani *et al.* in press). Within Iran, there are three main mountain chains: Alborz, Zagros and Kopet Dagh. The Zagros Mountains harbor high species endemism that justifies considering this area as a separate floristic province, as c. 46% of alpine endemic species in Iran are restricted to the Zagros Mountains (Noroozi *et al.* 2008). The mountain range stretches along the western border of Iran from northwest to southwest. There are several mountain peaks in the Zagros Mountains with an elevation higher than 4000 m, and many endemic species, such as: *Stipa iranica* (Poaceae), *Azilia eryngioides*, *Pyncocycla flabellifolia* (Apiaceae), *Ptercephalus wendelboii* (Dipsacaceae), *Zerdana anchonioides* (Brassicaceae, monotypic), *Rumex ephedroides* (Polygonaceae), *Euphorbia acanthodes*, *E. plebeia* and *Andrachne merxmulleri* (Euphorbiaceae). Based on *Flora Iranica* (Rechinger & Schiman-Czika 1964), there are more than ten endemic species of Euphor-

biaceae in the Zagros Mountains, and it seems that there will be more new species in the region. High morphological plasticity and diversity of *Euphorbia* as well as a paucity of previous studies conducted on *Euphorbia* in Iran make taxonomical studies of the genus attractive for botanists. During the study and revision of the *Euphorbia* material in the IRAN and TARI herbaria, several specimens collected in the provinces of Chaharmahale Bakhtiari, Esfahan and Fars (a rather poorly investigated area) did not match the descriptions of any known species. Closer investigation revealed that the material represents a hitherto undescribed species of *Euphorbia* subgen. *Esula* Pers. (section *Paralias* Dumort., subsection *Coniocarpae* Prokh). In this paper, a new species is reported as a Zagros element with geographical distribution map, carpology, habit and brief characteristics of ecology as well as a comparison with the close species *E. microsciadia* in a table.

MATERIAL AND METHODS

This study is mainly based on plant material deposited in the Iranian herbaria IRAN and TARI. Several field trips were conducted in different parts of Iran, and the resulting collections were deposited in these herbaria. Measurements of vegetative and reproductive parts were carried out under a stereomicroscope (Olympus SZH).

In the genus *Euphorbia*, seed coat and caruncle features have been reported to have paramount importance in the systematic relationships between taxa at different ranks, and even in species delimitation (Khan 1964; Richardson 1968; Ehler 1976; Radcliffe-Smith 1980, 1982; Simon *et al.* 1992; Park 2000). Thus, to investigate the seed coat sculpturing and caruncle of *E. iranshabri*, mature seeds were mounted directly on 12.5 mm diameter stubs, attached with sticky tape and then coated in a sputter coater with a gold/palladium layer approximately 25 µm thick. Morphological observations were carried out with a Zeiss DSM 960 Scanning Electron Microscope (SEM). To check the stability of the morphological characters and their putative taxonomic use, several specimens from the same and different populations were examined us-



FIG. 1. — *Euphorbia iranshahri* Pahlevani: **A**, habit; **B**, cyathium; **C**, fruit; **D**, seed. *Mozaffarian 93796*. Scale bar: A, 1 cm; B, 0.5 mm; C, 1.1 mm; D, 0.6 mm.

TABLE 1. — Characters distinguishing *Euphorbia iranshahri* Pahlevani from *E. microsciadia* Boiss.

Species	Ray-leaves		Cyathia lobes	Glands	Capsules	Seeds
	Rays number	number				
<i>E. iranshahri</i>	(5) 6-8	(5) 6-8	Acuminate and subulate, longer or equal with anthers	Variable, with long to short or rarely without horns	Sharp-keeled	Smooth
<i>E. microsciadia</i>	4-5 (6)	4-5 (6)	Deltoid, obviously shorter than anthers	Variable, hornless or with short horns	Obtuse-keeled	Foveolate

ing SEM. Comparisons were made in reference to geographical distribution, carpology, habit and brief characteristics of ecology with close species.

The distribution maps of *E. iranshahri* and *E. microsciadia* are provided using the computer program DMAP (Morton 2001).

SYSTEMATICS

Euphorbia iranshahri Pahlevani, sp. nov.

(Fig. 1)

Differt ab E. microsciadia umbellae radiis 6-8 (raro 5), involucri phyllis 6-8 (raro 5), involucri dentibus longe subulatis a staminibus longioribus (nec brevioribus et nec deltoideis), coccis dorsum acute angularibus (nec obtusis), seminibus laevibus (nec foveolatis).

TYPUS. — Iran. Chaharmahale-Bakhtiari, Shahrekord, Farsan, Babaheidar, Sefiddaneh, 2360 m, 32°20'25"N, 50°24'45"E, 4.VI.2008, *Mozaffarian 93796* (holo-, TARI!; iso-, IRAN!).

OTHER MATERIAL EXAMINED. — Iran. Esfahan, Semirum, Kuh-e Pashmaku, 2650-3000 m, 6.VI.1974, *Iranshahr 18016* (IRAN). — Same data, 2820 m, 27.VII.2009, *Pahlevani & Bahramishad 53913* (IRAN). — Chaharmahale Bakhtiari, 12 km Broujen, Faradonbeh, 2300-2700 m, 31.V.1974, *Iranshahr 18110* (IRAN). — Gandoman, 2100 m, 6.VI.1973, *Iranshahr & Moussavi 18122* (IRAN). — Lordegan to Goushaki, 21 km to Lordegan, 5.VI.1973, *Iranshahr & Moussavi 18119* (IRAN). — 22 km Shahr-e Kord to Broujen, 6.VII.2009, *Djavadi, Ghanbari & Tonabi 53914* (IRAN). — Kouhrang, Marboreh, 2350 m, 24.VI.2008, *Eskandari et al. 51489* (IRAN). — Brujen, Sibak to Naghoun, 2100-2200 m, 6.VI.1973, *Iranshahr & Moussavi 18102* (IRAN). — Fars, Abadeh, Dolatabad, 23.V.1966, *Borumand 47989* (IRAN). — Abadeh, Shahrman, 2300 m, 10.VI.1969, *Termeh & Izadyar 47938* (IRAN).

DESCRIPTION

An erect and much-branching glabrous perennial herb. Cauline leaves alternate, sessile or subsessile, obovate, oblanceolate or sometimes oblong, 3-4 × 1-1.5 cm, acute, entire, tapered or cuneate at the base, palminerved. Rays (5) 6-8, without axillary rays; ray-leaves 6-8, obovate or oblanceolate; raylet-leaves opposite, resembling to other leaves but smaller than them, acute or mucronulate. Cyathia sessile or rarely subsessile; cyathia lobes subulate and longer than or sometimes equal with anthers. Glands variable, yellowish-ochreous or brown, crescent, concave on the outer edge with or without 2 horns, horns short or long, simple and stramineous. Capsules 5-6 × 4-5 mm, long-pedicellate, trilobate, sharp-keeled and smooth. Seeds oblong or ellipsoid, 3-4 mm long (without caruncle), smooth, papillose (with high magnification), pale gray or yellowish; caruncle 1-1.5 mm, obtuse and conical.

REMARKS

Despite the high morphological plasticity of *E. microsciadia* Boiss. in many respects, such as height of plant, length of rays, the number of rays and ray-leaves, and the shape of the glands, it is obviously different from *E. iranshahri* in seed ornamentation (Fig. 2A-C, E-G), lobe of cyathium and keel of the capsule (Table 1). According to Figure 2A-C, E-G, it is obviously recognized there is no ornamentations on the entire seed surface of *Euphorbia iranshahri* (Fig. 2A, B) while there are many irregular ornamentation on seeds of *E. microsciadia* (Fig. 2E, F). These two taxa can, however, be distinguished from one another by several features, combined with their different substrate preferences as summarized in Table 1.

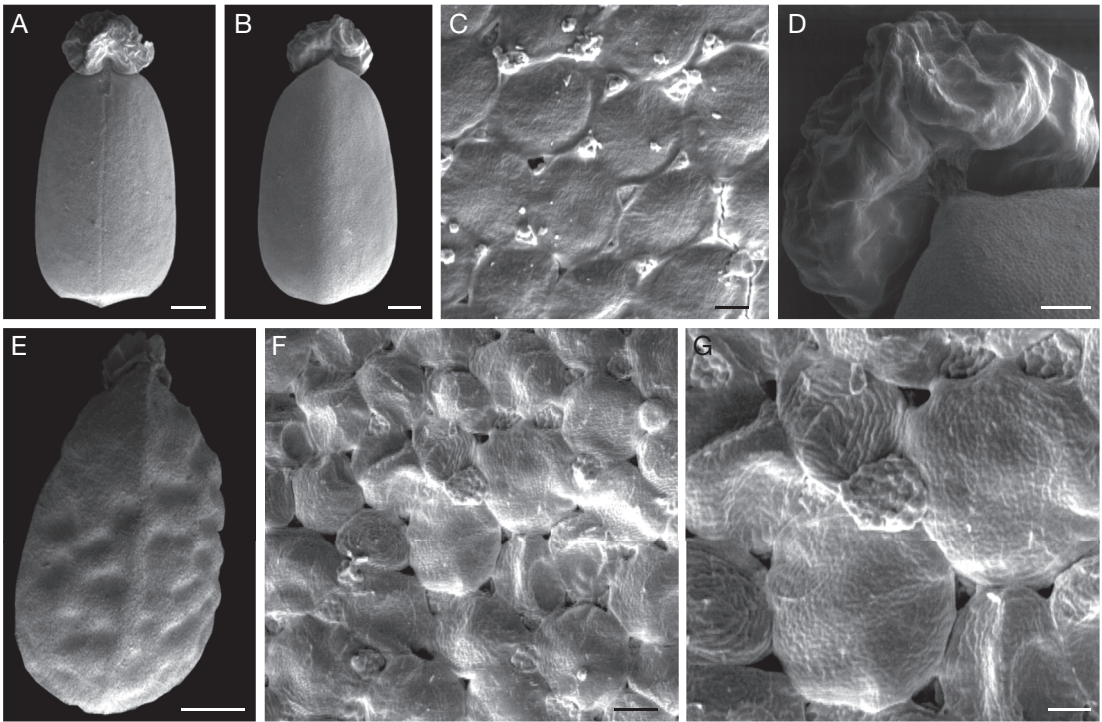


FIG. 2. — SEM images of the seed surface and caruncle of *Euphorbia iranshahri* Pahlevani, *Mozaffarian* 93796 (TARI) P (A-D) and *E. microsciadia* Boiss., *Pahlevani & Bahramishad* 53826 (IRAN) (E-G); *Euphorbia iranshahri* Pahlevani sp. nov., 93796 (TARI): A, ventral view; B, E, dorsal view; C, F, G, surface; D, caruncle. Scale bars: A, B, E, 500 μ m; C, F, 10 μ m; D, 200 μ m; G, 5 μ m.

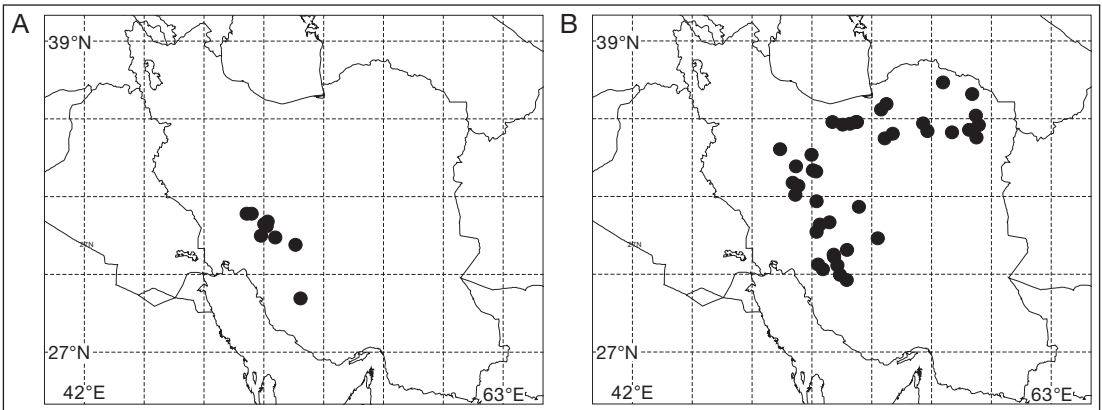


FIG. 3. — Distribution of: A, *Euphorbia iranshahri* Pahlevani; B, *E. microsciadia* Boiss. in Iran.

DISTRIBUTION

Euphorbia iranshahri is restricted to the middle to high altitudes of the Zagros Mountains, comprising

Chaharmahal Bakhtiari, Esfahan and Fars provinces (Fig. 3A), growing on rocky slopes from c. 2100-3000 m altitude. In contrast, *E. microsciadia* not only

occurs in Zagros regions but also in Alborz, Khorasan Mountains and Central Iran (Fig. 3B).

ETYMOLOGY

Euphorbia iranshahri is named in honor of Musa Iranshahr, a pioneering botanist of Iran who contributed extensively to Prof. Karl Heinz Rechinger's Flora Iranica project, and has collected material of this newly described *Euphorbia* species.

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