



## *Euphorbia prostrata* Aiton (Euphorbiaceae) – an adventive species new in Serbia

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**ABSTRACT:** In the vascular flora of Serbia, the genus *Euphorbia* is represented with 36 species belonging to the subgenera *Esula*, *Chamaesyce*, *Euphorbia* and *Rhizanthium*. Five species of *E.* subg. *Chamaesyce* have been recorded so far in Serbia: *E. chamaesyce*, *E. maculata*, *E. humifusa*, *E. nutans* and *E. davidii*. During our research on the flora of Belgrade in 2012, we found a species new for the vascular flora of Serbia - *E. prostrata* from the mentioned section, on the banks of the Sava River.

**KEYWORDS:** *Euphorbia prostrata*, Euphorbiaceae, new records, adventive species, Serbia

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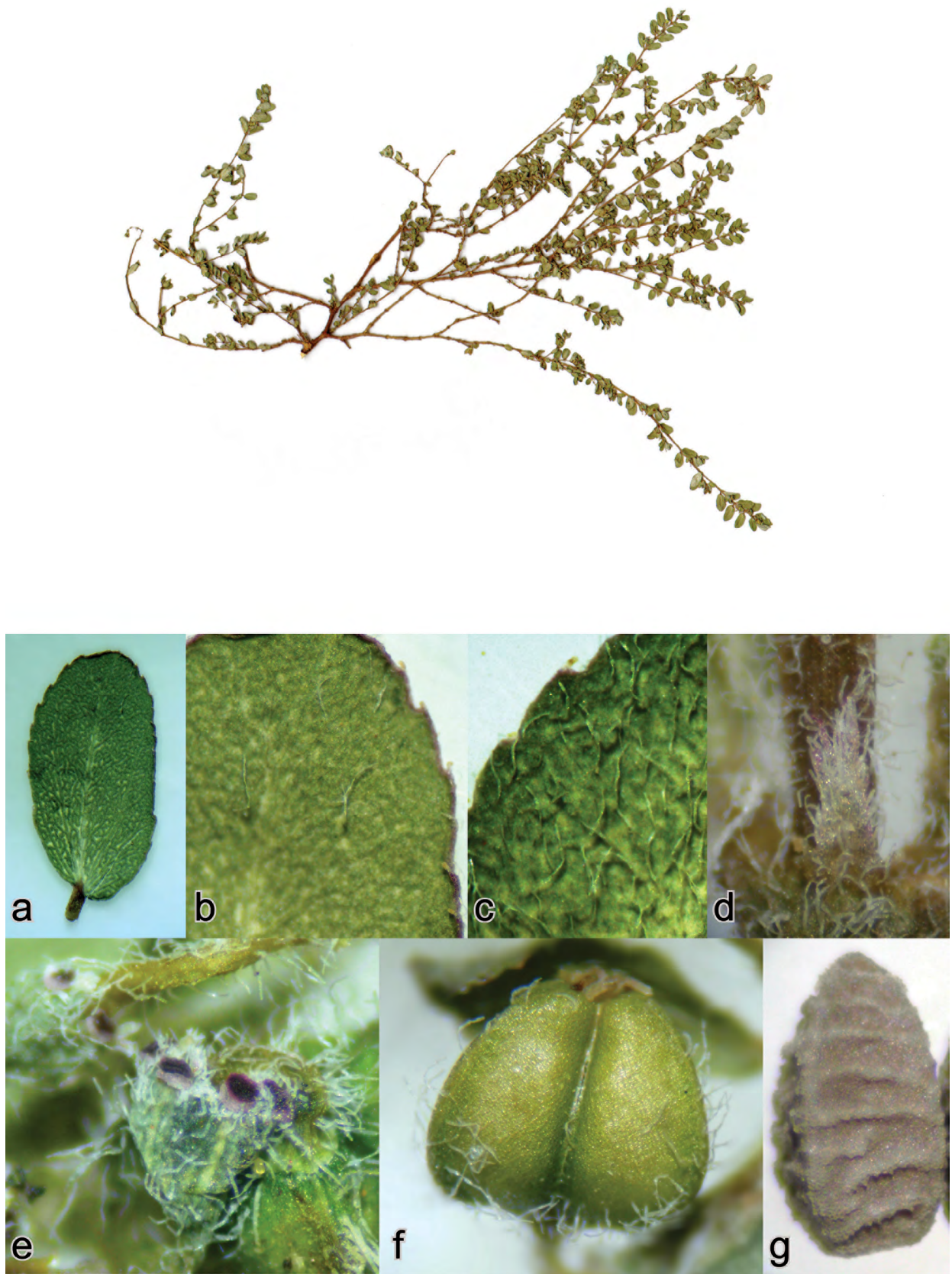
With around 2,000 species, the genus *Euphorbia* L. is one of the largest genera of the planet's vascular flora. Species of this genus mostly inhabit subtropical and temperate regions (STEJNMANN & PORTER 2002; BRUYNS *et al.* 2006). The genus consists of four subgenera: *Euphorbia* subg. *Esula* Pers., *E.* subg. *Chamaesyce* Raf., *E.* subg. *Euphorbia* and *E.* subg. *Rhizanthium* (Boiss.) Viler (= *E.* subg. *Athymalus*) (STEJNMANN & PORTER 2002; BRUYNS *et al.* 2006; HORN *et al.* 2012; PEIRSON *et al.* 2013). The greatest number of taxa belong to *E.* subg. *Euphorbia* (ca. 700), around 500 and 350 belong to *E.* subg. *Esula* and *E.* subg. *Chamaesyce*, respectively, while the smallest number of taxa belong to the African subgenus *E.* subg. *Rhizanthium* (ca. 200) (YANG & BERRY 2011; HORN *et al.* 2012; YANG *et al.* 2012). Although *E.* subg. *Chamaesyce* most likely originated in the Old World (STEJNMANN & PORTER 2002), the greatest number of taxa (ca. 210) belong to the New World flora (YANG & BERRY 2011).

The subgenus *E.* subg. *Chamaesyce* is characterised by several specificities, i.e., early abortion of apical meristem of the main stem followed by sympodial growth, opposite arrangement of often asymmetric leaves, petaloid appendices on cyathium glands, etc. (STEJNMANN & PORTER 2002; BRUYNS *et al.* 2006; PAHLEVANI & RIINA 2011; HORN *et al.* 2012). In addition to morphological characters, recent molecular

data also support the separation of *E.* subg. *Chamaesyce* (STEJNMANN & PORTER 2002; BRUYNS *et al.* 2006; YANG & BERRY 2011; HORN *et al.* 2012; YANG *et al.* 2012).

Representatives of the *E.* subg. *Chamaesyce* are annual or perennial plants, bushes or trees, rarely geophytes. Stems and leaves are sometimes more or less succulent, but never cactus-like. The main root is elongated or compressed, cylindrical to spherical in shape. Stems are usually erect, sometimes ascending, descending, prostrate, decumbent or procumbent, usually branched, alternating or opposite. Leaves are opposite or alternating, glabrous or pubescent, sometimes dark green in colour. Stipules are glandular, linear, triangulate or inconspicuous. The cyathium is bisexual, rarely unisexual, solitary or in an inflorescence, terminal or lateral, green or sometimes brightly coloured, actinomorphic or mildly zygomorphic. Interpetiolar stipules with 4–5 petiolate (rarely horn-like) appendices are located on the edge of the cyathium (STEJNMANN & PORTER 2002). The pistil is glabrous or pubescent, with three free or fused styles. The capsule is three-lobed or rarely subspherical. Seeds are oval or elongated, four-sided, rarely three-sided or round on cross-section. The surface of seeds is smooth or differently ornamented, with or without a caruncle (SMITH & TUTIN 1968).

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**Fig. 1.** *Euphorbia prostrata* habit and details: a - leaf, b - upper surface of leaf lamina, c - lower surface of leaf lamina, d - stipules, e - cyathium, f - capsule, g - seed.

In the vascular flora of Serbia, the genus *Euphorbia* is represented with 36 species, of which only five belong to *E.* subg. *Chamaesyce*: *E. chamaesyce* L., *E. maculata* L., *E. humifusa* Willd. and *E. nutans* Lag. (JANKOVIĆ & NIKOLIĆ 1972; JANKOVIĆ 1986), and *E. davidii* Subils (PURGER *et al.* 2015).

*Euphorbia prostrata* (prostrate sandmat) is native to tropical and subtropical regions of the Americas, from where it was introduced into the Mediterranean region (SMITH & TUTIN 1968). It grows on sandy, trampled ruderal areas, along railroad tracks, near roads or between rocks in gardens and fields. It flowers from mid-June to September.

In Europe the species was first reported in the south of France in 1806 (BATORI *et al.* 2012 and refs. cited therein), but it has spread throughout most of Southern and Central Europe since then. In our region, this species has been recorded so far in Slovenia (FRAJMAN & JOGAN 2007), E and SE Austria (ADLER *et al.* 2008), SE Hungary (BATORI *et al.* 2012), Romania (ANASTASIU & NEGREAN 2008), Croatia (MILOVIĆ & RANDIĆ 2001), Montenegro (PULEVIĆ 1984) and Greece (SMITH & TUTIN 1968; GREUTER & RAUS 2001).

Individuals of *E. prostrata* were collected on the banks of the Sava River in Belgrade (Savski quay – near city block 70a - 44°47'46.4" N, 20°24'02.2" E), between rocks of the quay and promenade. The voucher specimen is deposited in the herbarium of the Institute of Botany and Botanical Garden "Jevremovac" (BEOU 16682).

**Taxonomic position:** *Euphorbia prostrata* Aiton [syn.: *Anisophyllum prostratum* (Aiton) Hav., *Chamaesyce prostrata* (Aiton) Small, *Tithymalus prostratus* (Aiton) Samp.] belongs to the *E.* sect. *Anisophyllum* Roep. Representatives of this section have an asymmetric laminar base of the leaves, a cyathium clustered on short, lateral branches and nectaria with membranous appendices. The species is also included in *E.* subsect. *Hypericifoliae*, consisting of plants with triangular or scarious bracts.

**Description:** Much-branched prostrate annual herb, with pubescent procumbent 20-cm-long branches (Fig. 1). Leaves (2) 8–10 (15) mm long, (1) 4–6 (8) mm wide; lamina ovate, obliquely rounded at the base, obscurely toothed at the margin. The upper surface of the lamina is glabrous, while the lower surface is sparsely pilose (Fig. 1a, b, c). Stipules up to 1 mm long, triangular, pilose (Fig. 1d). Cyathia with barrel-shaped involucre, glands with minute appendages on the edge (Fig. 1e). Capsule 1.5 mm in diameter, acutely 3-lobed with truncate base. Capsule glabrous, except for the long hairs on sutures (Fig. 1f). Seeds 0.8–1.0 mm long, 0.5–0.6 mm wide, ovate to four-angled on cross-section, with numerous distinct transverse ridges and grooves, greyish in colour (Fig. 1g).

*Euphorbia prostrata* has not been reported so far for the flora of Serbia, most likely because it resembles *E. chamaesyce* and *E. maculata*, and grows in similar habitats. There are slight morphological differences in size of the leaf, pubescence of the capsule and texture of the seed coat. Leaves of *E. maculata* are 2-3 times longer than wide, while leaves of *E. chamaesyce* and *E. prostrata* are only slightly elongated (1-2 times longer than wide). Capsules of *E. maculata* ( $\pm$  appressed hairs) and *E. chamaesyce* are evenly pubescent, while in *E. prostrata* hairs are found only on the base and sutures. The seeds of *E. maculata* have transverse grooves (3-5 grooves), those of *E. prostrata* have 5-8 grooves, while in *E. chamaesyce* the seeds are ruminant or irregularly reticulate-foveate.

In recent SEM studies of euphorb seeds, it was shown that seed micromorphology can be used for differentiation of morphologically very similar species, namely *E. prostrata* from *E. maculata* and *E. chamaesyce* (HEUBL & WANNER 1996). Many other studies (FAYED & HASSAN 2007; PAHLEVANI & AKHAN 2011; SALMAKIA *et al.* 2011) have also confirmed the significance of surface structures of the seed testa, as indicated in numerous papers published in the last decade. We were able to confirm this in our research, since individuals of *E. maculata* were found at the same locality.

**Way of introduction.** It is yet unknown how this species was introduced into Serbia. Most of the published data place this plant alongside railroad tracks and railroad stations in Europe, mostly in disturbed areas of cities.

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## REZIME

## *Euphorbia prostrata* Aiton (Euphorbiaceae) - nova adventivna vrsta u Srbiji

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U vaskularnoj flori Srbije rod *Euphorbia* zastupljen je sa 36 vrsta svrstanih u podrodove *Esula*, *Chamaesyce*, *Euphorbia* i *Rhizanthium*. Iz podroda *E.* subg. *Chamaesyce* su do sada zabeležene vrste *E. chamaesyce*, *E. maculata*, *E. humifusa*, *E. nutans* i *E. davidii*. Tokom istraživanja roda *Euphorbia* na području grada Beograda, 2012. godine, na obali reke Save pronašli smo *E. prostrata*, do sada nepoznatu u flori Srbije.

**KLJUČNE REČI:** *Euphorbia prostrata* Aiton, Euphorbiaceae, nova vrsta, adventivna vrsta, Srbija.