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***Euphorbia greuteri* (Euphorbiaceae), a new single-spined succulent from the foothills of Jabal Urays, Abyan, Yemen**

Abstract

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A dwarf pulvinate succulent perennial of the group of single-spined species of *Euphorbia* sect. *Euphorbia* from the foothills of the volcanic Jabal Urays massif, on the coast of the Gulf of Aden, is described as a species new to science and illustrated. It was formerly identified with *E. triaculeata* from the coastal plains of the Red Sea, but differs even habitually by medusoid growth similar to *E. actinoclada*. The species is named in honour of Prof. Werner Greuter.

Key words: angiosperms, taxonomy, Arabian Peninsula, medusoid growth, *Euphorbia triaculeata*.

The present contribution deals with a hitherto neglected species of that group of succulent spiny euphorbias whose spine shields have a single central spine besides the two, usually much smaller secondary spines or prickles. In contrast to the commoner pair-spined euphorbias they are frequently named “three-spined” (“triacanth-”, compare *Euphorbia* subsect. *Triacanthae* Pax, *E.* sect. *Triacanthium* Jacobsen, but for a revised system of *E.* subg. *Euphorbia* see Carter 1994). However, the term “single-spined” is more correct, since the pair of secondary spines or prickles is usually also present in the pair-spined species. Moreover, the seedlings of species with a single central spine initially produce paired spines (Carter 1982: 3, illustrated by Veldhuisen 2003-04: 22), evidencing the single spine as apomorphic. Very soon after, the spine pairs are first partly and then entirely fused to a single, or in a few species distally separated, central spine.

The first species described of this group and its hitherto only known member on the Arabian Peninsula is *Euphorbia triaculeata* Forssk., distributed on both sides of the southern Red Sea (Sudan, Eritrea, Djibouti, Saudi Arabia and Yemen; Andrews 1952: 78, Audru & al. 1994: 313, photos 102-105, Edwards & al. 1995: 345-346, Collenette 1999: 322, Wood 1997: 184). Otherwise this group is distributed in the Horn of Africa region and further south to Kenya and Tanzania. While Pax (1904) recognised only nine species, field studies, additional collections and

cultivation of plants led to the distinction and description of several more species since the early 1980s (Carter 1982, 1987a-b, 1992, Carter & Radcliffe-Smith 1988, Holmes 1993). Presently about 20 species are recognised.

Euphorbia triaculeata was collected by Forsskål in May 1763 in W Yemen near Musa, a settlement situated on the road from Mocha to Taïz just where the coastal plain grades into the foothills of the escarpment. Forsskål (1775: 94) described it as an almost 0.5 m tall, diffusely branched shrub (“*Frutex cubitalis, diffusum ramosus*”), which is common there. The holotype at Copenhagen (see Hepper & Friis 1994: 157) is pictured in the microfiche edition of the Forsskål herbarium (IDC 2200 microfiche 43, photos 5 [one branch], 6 [handwritten species name]). The photographs given by Collenette (1987: 106, 1999: 322) of plants from Saudi Arabia are a good representation of this species; a close up of a flowering branch of a plant from the Yemeni Red Sea coast is illustrated by Deil & Müller-Hohenstein (1988: 111). *E. triaculeata* reaches a height of 0.8 m (Wood 1997: 184) or even up to 1.2 m (Edwards & al. 1995: 345), it is much-branched from near the ground with more than 0.5 m long, spreading branches of (without spines) c. 0.5-1 cm in diameter, repeatedly rebranching (Edwards & al. 1995: 345). The branches are glaucous (Carter 1982: 16) to pinkish grey (Collenette 1999: 322) and with paler longish markings; the cyme, as usually in *E. sect. Euphorbia* (Carter 1982: 3), is forked once, producing a central staminate cyathium and two bisexual, proterogynous lateral cyathia, all yellow and of c. 4 mm in diameter (Edwards & al. 1995: 345). *E. triaculeata* on the Arabian Peninsula is restricted to the coastal plains of the Red Sea (below 400 m altitude) and is largely confined to sandy hillocks, stabilized sand dunes and hard, gravelly sand shaded by *Acacia* (Deil & Müller-Hohenstein 1988: 110, Collenette 1987: 105, Wood 1997: 184).

Identified with *Euphorbia triaculeata* has been also a population of euphorbias from the foothills of Jabal Urays [Urays Mts, or al-Areys Mts] E of the town of Shuqra on the Gulf of Aden, first mentioned by Deflers (1895: 422). Much later the population was revisited by J. Lavranos and W. Rauh in 1964, first photographs were taken (Rauh 1966: 209, fig. 26), but again the plants were identified with *E. triaculeata*, a fate they shared with several other single-spined species in East Africa. The authors of the present contribution came across this *Euphorbia* population in March 2002 during their studies of xerotropical paleo-African refugia in the southern coastal mountains of Yemen in the course of the Yemeni German Project within BIOTA [Biodiversity Monitoring Transect Analysis] East Africa (Anon. 2004: 163-218, Kilian & al. 2004, Rabe & Kilian 2004). A cutting taken from this population has been cultivated in the Botanic Garden Berlin-Dahlem, where it flowers occasionally but has never so far set seeds. Closer examination of this *Euphorbia* in the light of the literature about the single-spined euphorbias revealed that it is morphologically, habitually and ecologically different from *E. triaculeata* as well as from species of the Horn of Africa region and deserves recognition as a separate species.

Euphorbia* (sect. *Euphorbia*) *greuteri* N. Kilian, Kürschner & P. Hein, **sp. nov.*

Holotype: Yemen, Abyan governorate, Jabal Urays, from lower Wadi Asurie crossing the eastern ridge into the neighbouring Wadi Abad, 13°27'37.6"N, 45°55'38.5"E, 200-550 m, black lava and lava gravel, 16.3.2002, Kilian & al. YP [Yemen Project] 1724 (B) – Fig. 1-2.

Planta succulenta affinis *Euphorbiae triaculeatae*, sed habitu pulvinato, rami multo minoribus non variegatis e centro imo pulvini exortis et podariorum parte decurrenti latiore et brevioribus valde differt.

Eponymy. – It is with great pleasure that we dedicate this species to Prof. Werner Greuter on the occasion of his 68th birthday, in appreciation of the many years shared at Berlin-Dahlem as his students and co-workers or as colleague, respectively.

Dwarf succulent perennial forming a compact cushion less than 15 cm high. *Caudex* shallowly hemispherical, with simple to moderately rebranched, densely tufted, spreading to procumbent branches radiating at ground level from the growing-point in the centre of the cushion. *Branches*



Fig. 1. A: Habitat of *Euphorbia greuteri* in the foothills of Jabal Urays facing the Gulf of Aden; B-C: *E. greuteri*, habit at type locality. – Photographs by P. Hein (B) and N. Kilian (A, C), March 2002.

up to c. 20 cm long and c. 1-1.5 cm wide (without spines), greyish green, with the spine shields situated on distinct tubercles in 5 spiral series (= in 7 longitudinal lines). *Spine shields* (podaria) brownish when young, becoming ash grey, subequilaterally rounded-triangular, transversal extent 2.3-2.6 mm, vertical extent 2.4-2.7 mm, the decurrent part (from the spine base to the lower edge) c. 1.2-1.4 mm; *spines* single, slender, 10-18 mm long, ash grey, distally often blackish; *prickles*



Fig. 2. *Euphorbia greuteri* – A: habit; B: close up of shoot apex with the tiny leaves; C: close up of branch showing the spine shields; D: cymes in bud and very early stage of flowering; E: bract of involucre (bottom) and lobe of cyathium (top); F: staminate flower; G: pistillate flower (ovary broken on left side). – Scale bars: B-D = 2.5 mm, E-G = 0.5 mm; photographs by N. Kilian (A-B), M. Meyer (C-D) and E. Scherer (E-G) of a plant from the type locality cultivated at the Botanic Garden Berlin-Dahlem.

1.6–3.2 mm long. *Leaves* tiny and very early caducous, only present at the top of the branches, acute-ovate, c. 1×1 mm. *Cymes* solitary, subsessile, 1-forked. *Cyathia* subsessile, pure yellow, the central cyathium staminate, the two lateral cyathia bisexual, proterogynous; *bracts* of the *involucre* c. 1.4×0.9 mm, almost rectangular, the truncate apex marginally denticulate; *involucre* infundibuliform, c. 3 mm long and, including the glands, 4.2–4.5 mm in diameter; *glands* 5 (in the central cyathium rarely 6), patent, transversely rectangular, $1\text{--}1.2 \times 1.8\text{--}2$ mm; *lobes* approximately quadrate-oval, distally irregularly deeply dentate, c. 1.2×1.2 mm. *Staminate flowers* at the base with deeply dentate bracts, pedicel c. 2.6 mm long, filament 0.8–1 mm long. *Pistillate flowers* with a pedicel c. 1.2 mm long, styles 3, basally connate, 1.3–1.4 mm long. *Capsule* and *seeds* not seen.

Taxonomy. – The growth and habit of *Euphorbia greuteri* is essentially different from *E. triaculeata*. Similar to *E. actinoclada* S. Carter and *E. immersa* Bally & S. Carter from SE Ethiopia-NE Kenya and N Somalia respectively (Carter 1982, Holmes 1993), *E. greuteri* has a low, relatively compact, almost cushion-like habit with densely set, short and mostly simple branches. As in these species and in contrast to *E. triaculeata*, where the main stem is largely similar to its branches, *E. greuteri* has a medusoid growth: elongation of the main stem is suppressed and the innovations arise from a caudex in the centre of the cushion at ground level, with branches thus radiating from the central growing-point. Before new branches shoot forth, radial growth at the growing-point at ground level opens the cushion in its centre, forcing the older branches aside. Only then longitudinal growth of the new branches starts, closing the centre of the cushion again (see photographs for *E. actinoclada* by Veldhuisen 2003-04: 19).

The branches are uniformly greyish green to glaucous and are not variegated with longish paler blotches as is usual in *Euphorbia triaculeata* and is particularly pronounced in *E. actinoclada*. Plant size and branch length of *E. greuteri* seem comparable to *E. actinoclada*; *E. immersa*, in contrast, is dwarfier with branches less than 5 cm long and also otherwise readily distinguished by absent or vestigial prickles, shorter spines and smaller cyathia.

The shape of the spine shields of *Euphorbia greuteri* is quite different from that of both *E. actinoclada* and *E. triaculeata*: these species have particularly narrow, long-decurrent spine shields, which are up to 9 and 10 mm long respectively, only 1.5 mm wide, and with a decurrent part less than 1 mm wide and more than (1-)2 times longer than the shield from the spine base to its upper edge.

The cyathia of *Euphorbia greuteri* are intermediate in size between the slightly larger, equally yellow ones of *E. triaculeata* and the slightly smaller, red-glanded ones of *E. actinoclada*.

Distribution and ecology. – *Euphorbia greuteri* is only known from the lower foothills of the volcanic Jabal Urays [al-Areys] massif at altitudes between c. 100 and 300 m (Fig. 1A), where single individuals grow scatteredly on the rocky to gravelly volcanic substrate. The geologically isolated massif is well known for its local endemism and phytogeographical significance (Miller & Nyberg 1991, Kilian & al. 2004). *E. greuteri* is part of the xeric understorey of a very sparse *Acacia-Commiphora* woodland with the endemic, recently described *A. harala* Thulin & Gifri.

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