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# *Rhabdotosperma saudi-arabicum* (Scrophulariaceae), a new species from Saudi Arabia

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**Summary.** A new species of *Rhabdotosperma* (Scrophulariaceae) is described from southwestern Saudi Arabia. For 75 years, the species was confused with *R. bottae* and *Verbascum melhanense*. The new species is illustrated with information on identification, distribution, specimens examined, habitat, conservation status, phenology, etymology, and taxonomic notes.

**Key Words.** Al-Soudah, Arabian Peninsula, Asir, Critically endangered, Endemic, *Verbascum*.

## Introduction

The genus *Rhabdotosperma* Hartl belongs to the family Scrophulariaceae in the tribe Scrophularieae (Oxelman *et al.* 2005). It was separated as a new genus from *Verbascum* by Hartl (1977), (formerly recognised as *Celsia* L. and *Verbascum* L. sect. *Aulacospermae* by Murbeck 1925, 1933) on account of seed morphology, a distinction followed by Lobin & Porembski (1994) and Fischer (2004). *Rhabdotosperma* species are distinguished from their closely related *Verbascum* sister species by having longitudinally furrowed seeds (aulacospermous), a dilated to disciform stigma, and the absence of accessory flowers (Hartl 1959, 1977; Fischer 2004). The genus comprises seven species (Hartl 1977; Lobin & Porembski 1994; Fischer 2004; Christenhusz *et al.* 2017).

In tropical Africa, six species of *Rhabdotosperma* were listed by Hartl (1977), namely, *R. densifolium* (Hook.f.) Hartl, *R. brevipedicellatum* (Engl.) Hartl, *R. ledermannii* (Schltr. ex Murb.) Hartl, *R. scrophulariifolium* (Hochst. ex A.Rich.) Hartl, *R. keniense* (Murb.) Hartl, and *R. schimperi* (Skan) Hartl. In the *Flora of Tropical East Africa*, Ghazanfar *et al.* (2008) treated the last two species as synonyms of *R. brevipedicellatum* and *R. scrophulariifolium*, respectively. Fischer (2006), however, treated *R. keniense* and *R. schimperi* as distinct taxa. *Rhabdotosperma bottae* (Deflers) Hartl is the only species reported from Yemen (Hartl 1977; Huber-Morath 1984; Wood 1997) and Saudi Arabia (Collenette 1985, 1998, 1999; Chaudhary 2001) in the Arabian Peninsula.

As part of an ongoing taxonomic revision of *Verbascum* and *Rhabdotosperma* in the Arabian Peninsula, some interesting specimens of *Rhabdotosperma* were examined that did not match any known species in the

area or the surrounding regions. A comprehensive investigation was carried out to ascertain whether these specimens warranted taxonomic distinction.

## Materials and Methods

Morphological and ecological data were gathered from relevant literature, herbarium specimens, and the first author's own observations during fieldwork in Saudi Arabia. Herbarium specimens were examined from BM, E, K, KSU, RIY, and the JSTOR Global Plants platform (<https://plants.jstor.org/>). The new species was assessed following the IUCN Red List Categories and Criteria (IUCN 2012), and the Geospatial Conservation Assessment Tool (GeoCAT) was used to analyse and estimate the extent of occurrence (EOO) and area of occupancy (AOO) with a grid size of 2 km<sup>2</sup> (Bachman *et al.* 2011). The distribution map was made with QGIS software version 3.22 (2022).

## Taxonomic Treatment

***Rhabdotosperma saudi-arabicum* A. Alzahrani, sp. nov.**  
Type: Saudi Arabia, Abha, Jabal Al-Soudah, Al-Soudah, 25 km NW of Abha, 2800 m, 22 Feb. 1982, I. S. Collenette 3316 (holotype K!).

<http://www.ipni.org/urn:lsid:ipni.org:names:77306699-1>

Biennial herb, dark green, simple or rarely branched, woody at the base, up to 40 cm tall. *Indumentum* dense glandular hairs. *Stems* erect, terete to angular. *Basal leaves* alternate, oblong-ovate, 8 – 10 × 3 – 4 cm, apex obtuse, base cordate, margins crenate, lamina dark green with sparse simple hairs on the veins below; petiole 4.5 – 6.5 cm, winged with 1 – 2 small lateral

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lobes. *Cauline leaves* oblong to oblong-ovate, 3.5 – 6.7 × 1.5 – 2.6 cm, apex obtuse, base cordate or semi-amplexicaul; sessile or petiole 0.8 – 2 cm. *Inflorescence* racemose; flowers single in the axil of bracts. *Upper bracts* lanceolate-triangular, 4 – 5 mm, acute. *Lower bracts* cordate-triangular, 10 – 40 mm, acute. *Pedical* covered with dense glandular hairs up to 6 mm long. *Calyx* 4 – 5 mm, lobes oblong, acute or mucronate, dense glandular hairs. *Corolla* 15 – 20 mm across, yellow with red streaks on the upper side and around the throat, without pellucid glands, tubeless, glabrous inside, sparse glandular hairs outside. *Stamens* 4, 3 – 5 mm long. *Filaments* red with yellowish-red hairs, two anterior glabrous near the apex, two posteriors with hairs up to the anthers. *Anthers* two anterior inserted obliquely on filaments, two posteriors with reniform anthers. *Ovary* pyriform-ovoid, sparse glandular hairs. *Style* up to 4 mm long, filiform, green or red. *Stigma* disciform. *Capsule* 6 – 8 × 4 – 5 mm, pyriform-ovoid, sparse glandular hairy. *Seeds* 0.6 – 0.7 × 0.4 – 0.5 mm, brownish, oblong-cylindrical, aulacospermous. Figs 1, 2 & 3.

**RECOGNITION.** *Rhabdotosperma saudiarabicum* is morphologically similar to *R. bottae* and *R. scrophulariifolium*, sharing with these two species similarly winged petioles, oblong calyx lobes, racemose inflorescences, four stamens, two anterior filaments that are glabrous near the top, pyriform-ovoid capsules, and oblong-cylindrical seeds. However, the new species can be distinguished from *R. bottae* by its alternate leaves (vs rosette), oblong-ovate leaves (vs oblong to oblong-lanceolate), crenate margins (vs crenate-denticulate), it has sparse, simple hairs on leaf veins below (vs dense, simple hairs), 5 – 6 mm long pedicels (vs 10 – 20 mm), two anterior filaments 3 – 5 mm long (vs 7 – 8 mm), two anterior anthers inserted obliquely on filaments (vs inserted decurrent longitudinally), style length of 3 – 4 mm (vs 8 – 15 mm), and capsules covered with sparse glandular hairs (vs glabrous). Furthermore, *R. saudiarabicum* differs from *R. scrophulariifolium* in having dense glandular indumentum (vs glandular with sparse, simple and forked hairs), oblong-ovate leaves (vs oblong), crenate margins (vs toothed-crenate), sparse, simple hairs on leaf veins below (vs dense, simple hairs on the veins on both



**Fig. 1.** *Rhabdotosperma saudiarabicum*. A, B habit, from Al-Soudah, Asir mountains, Abha, Saudi Arabia. PHOTOS: S. COLLENETTE.





**Fig. 2.** *Rhabdotosperma saudi-arabicum*. A leaf and petiole with two small lateral lobes (white arrow); B calyx and upper bracts (white arrow); C stems with glandular hairs (white arrow); D, E filaments with two anterior anthers inserted obliquely (white arrows); F capsules; G stigma disciform (white arrow); H seeds aulacospermous. A – E from *I. S. Colletette* 3316; F – H from *L. Boulos & A. S. Ads* 14165. PHOTOS: ALI ALZAHIRANI.

sides), 5–6 mm long pedicels (vs 6–30 mm), calyx 4–5 mm long (vs 6–9 mm), and capsules covered with sparse glandular hairs (vs glabrous). Morphological comparison of these three species is given in Table 1.

**DISTRIBUTION.** Al-Soudah, Asir Mountains, Abha, southwestern Saudi Arabia (Map 1).

**SPECIMENS EXAMINED. SAUDI ARABIA.** Abha: Jabal Al-Soudah, Al-Soudah, 25 km NW of Abha, 2800 m, 22 Feb. 1982, *I. S. Colletette* 3316 (K!, holotype); Al-Soudah, 3048 m, 1 July 1946, *D. Vesey-FitzGerald* 16082/4 (BM!); Al Mahmoud, 35 km N of Abha, 10 km below Jabal Al-Soudah, 21 May 1980, *L. Boulos & A. S. Ads* 14165 (K!); Waterfall beauty spot 10 km NW of Abha, Jabal Al-Soudah Road, 2530 m, 8 May 1985, *I. S. Colletette* 5368 (E!); Al-Soudah, 11 Aug. 1952, *J. D. Tothill* 116 (BM!).

**HABITAT.** The species is known from evergreen woodlands in the Asir mountains from Saudi Arabia at altitudes ranging from 2500–3000 m, where it grows in granite crevices and near streams. Associated plants observed within the locality include *Juniperus procera* Hochst. ex Endl., *Vachellia origena* (Hunde) Kyal. & Boatwr., *Hypericum revolutum* Vahl, *Dodonaea viscosa* subsp. *angustifolia* (L.f.) J.G.West, *Erica arborea* L., *Rosa abyssinica* R.Br. ex Lindl., *Clutia lanceolata* Forssk., *Euryops arabicus* Steud. ex Jaub. & Spach, *Nepeta deflersiana* Schweinf. ex Hedge, *Lavandula*

*dentata* L., *Mentha longifolia* var. *schimperii* (Briq.) Briq., *Plantago lanceolata* L. and *Veronica anagallis-aquatica* L.

**CONSERVATION STATUS.** *Rhabdotosperma saudi-arabicum* is endemic to Al-Soudah in the Asir Mountains of Saudi Arabia; three localities of five specimens are known from this area. The species was last recorded in 1985 by Colletette. However, during fieldwork in Al-Soudah in 2019, 2020, and 2021, the first author failed to find it, indicating that it might be either very rare or extinct from the type locality. The locality is under threat from suburban and agricultural expansion, colonisation by invasive species such as *Opuntia ficus-indica* (L.) Mill., *Nicotiana glauca* Graham, *Tagetes minuta* L., *Argemone ochroleuca* Sweet, and *Verbesina encelioides* (Cav.) Benth. & Hook.f. ex A.Gray, and recently, as a tourism destination and recreation area. Due to the close proximity of the localities where specimens of *R. saudi-arabicum* were recorded (Map 1), and to the fact that they face the same threats, we treated them as a single location based on the IUCN's definition of "location". Additionally, we estimated that the number of mature individuals may be less than 50, its extent of occurrence is 11.566 km<sup>2</sup>, and the area of occupancy is 12 km<sup>2</sup>. Therefore, we assessed the species as Critically Endangered (CR), meeting B1ab (iii)+D.

**PHENOLOGY.** *Rhabdotosperma saudi-arabicum* was collected with flowers from February to August and in fruit from May to July.





**Fig. 3.** *Rhabdotosperma saudiarabicum*. A habit; B leaf and petiole with two small lateral lobes; C flower (showing two anterior anthers inserted obliquely); D calyx and upper bract (densely covered in glandular hairs); E capsule; F seed. A – D from *I. S. Collett* 3316; E – F from *L. Boulos & A. S. Ads* 14165. DRAWN BY S. ALMALKI.

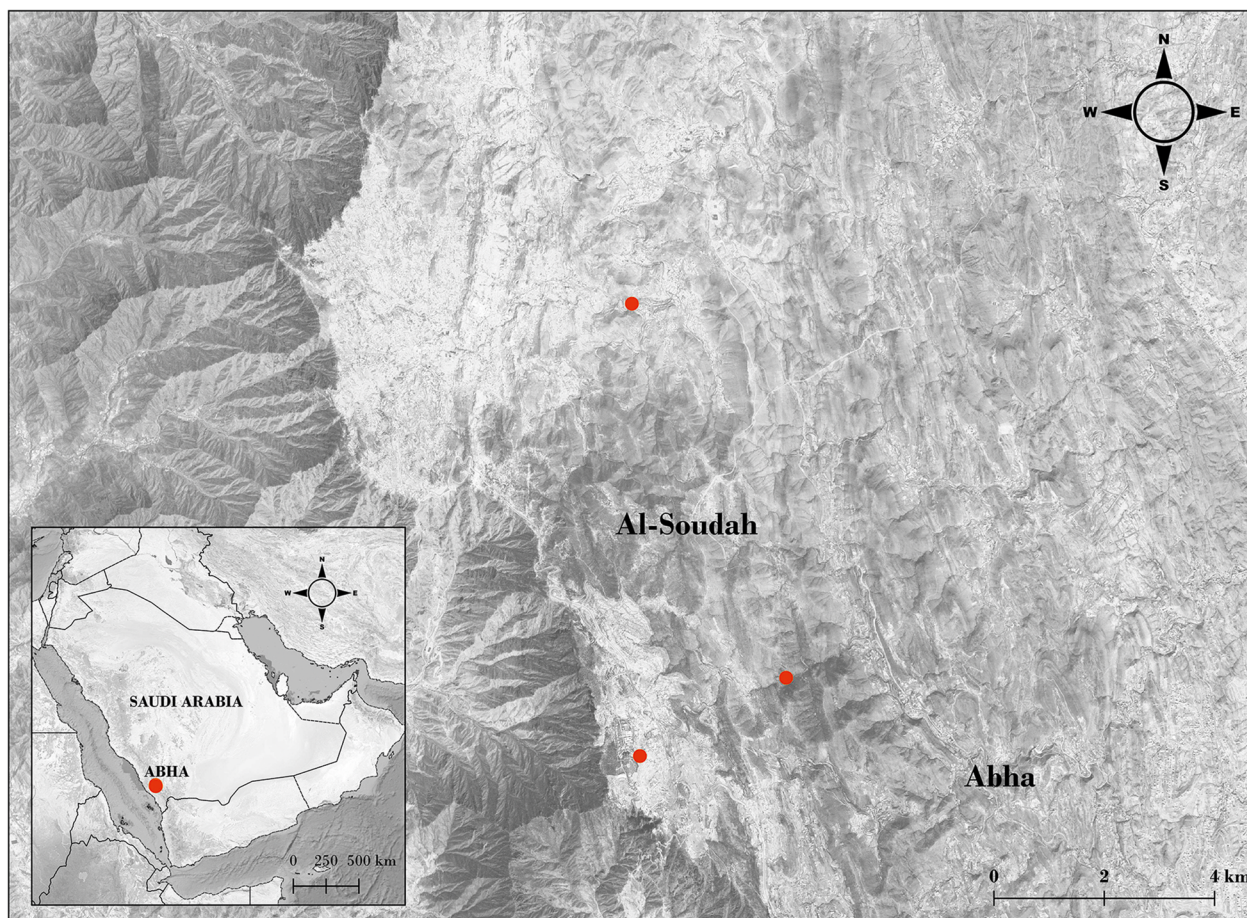
**Table 1.** Morphological comparison of *Rhabdotosperma saudiarabicum* and similar species.

Characters	<i>R. saudiarabicum</i>	<i>R. bottae</i>	<i>R. scrophularifolium</i> (Murbeck 1925)
Plant height (cm)	up to 40	up to 85	up to 120
Indumentum	densely covered with glandular hairs	densely covered with glandular hairs	densely covered with glandular hairs and sparse simple and forked hairs
Basal leaf dimensions (cm)	8 – 10 × 3 – 4	4 – 15 × 1 – 5	4 – 12 × 1.5 – 4
Petiole length (cm)	4.5 – 6.5	2 – 6.5	4 – 12
Pediceal (mm)	5 – 6	10 – 20	6 – 30
Calyx lobe length (mm)	4 – 5	4 – 5.5	6 – 9
Corolla indumentum	sparse glandular hairs outside	dense glandular hairs outside	sparse glandular hairs outside
Filaments (mm)	two anterior 3 – 5 with anthers inserted obliquely	two anterior 7 – 8 with anthers inserted decurrent longitudinally	two anterior 3 – 4 with anthers inserted obliquely
Style length (mm)	3 – 4	8 – 15	5 – 7.5
Capsule size (mm)	6 – 8 × 4 – 5	6 – 8 × 4 – 6	7 – 10.5 × 5 – 6.5
Capsule indumentum	sparse glandular hairs	glabrous	glabrous
Seed size (mm)	0.6 – 0.7 × 0.4 – 0.5	0.8 – 0.9 × 0.4 – 0.5	0.8 – 0.9 × 0.4 – 0.5

**ETYMOLOGY.** The specific epithet is derived from Saudi Arabia, where this species is endemic.

**NOTES.** Specimens of this newly described species were included in *Verbascum melhanense* (Murb.) Hub.-Mor. or *R. bottae* in all published floras of Saudi Arabia

(Collenette 1985, 1998, 1999; Chaudhary 2001), leading to its misidentification over the last 75 years. Seed morphology is the most distinctive and stable character separating *Verbascum* and *Rhabdotosperma* (Murbeck 1925, 1933; Huber-Morath 1978; Hartl 1977). Hence,

**Map 1.** Distribution map of *Rhabdotosperma saudiarabicum* in Saudi Arabia.



*V. melhanense* is not included in this morphological comparison of similar species presented in Table 1 because of the transversally elongated seeds (bothrospermous, Hartl 1959) that characterise *Verbascum*.

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### Declarations

**Conflict of interest.** The authors declare that they have no conflict of interest.

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