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## **Hypericum celikaensis (Hypericaceae), a new species from southeastern Anatolia (Adiyaman–Turkey)**

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# Hypericum celikaensis (Hypericaceae), a new species from southeastern Anatolia (Adiyaman–Turkey)

Mehmet Fırat & Hüseyin Eroğlu

## Abstract

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A new species, *Hypericum celikaensis* Fırat & Eroğlu, belonging to section *Arthropphyllum* Jaub. & Spach, is described and illustrated from Çelikhan/Adiyaman Province, Turkey. The species is similar to *H. rupestre* Jaub. & Spach and *H. cardiophyllum* Boiss. However, it is easily distinguished from *H. rupestre* by its two-lined stem and the free sepals (at base) with fewer black glands. It differs from *H. cardiophyllum* in having sessile black glands on sepals and asymmetrically retuse petals. In addition, the pollen and the seeds of both *H. celikaensis* and *H. rupestre* are characterized. An amended identification key to the species of *Hypericum* sect. *Arthropphyllum* in Turkey is provided, as well as detailed pictures of living plants.

## Keywords

HYPERICACEAE – *Hypericum* section *Arthropphyllum* – Turkey – Adiyaman – endemic – new species – taxonomy

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## Introduction

*Hypericum* L. is the largest genus of the family *Hypericaceae*, with about 36 sections and c. 500 species, distributed almost throughout the entire world (ROBSON, 2012). In Turkey, *Hypericum* is represented by 110 taxa classified in 20 sections, 48% of which are endemic to the country. Eastern Turkey and Transcaucasia are considered to be a kind of distribution center for the genus (ROBSON, 2010a, 2010b, 2012; ASLAN, 2012; YÜCE-BABACAN et al., 2017; BAŞKÖSE & SAVRAN, 2018; DIRMENCI & ROBSON, 2019; ÖZBEK et al., 2019; DÖNMEZ, 2000; DUMAN & ÇAKIR-DİNDAR, 2020; ÖZGIŞI & Ocak, 2021). The distribution and configuration of the glands on both sepals and petals is a useful and relevant character in the infrageneric classification of *Hypericum* (ROBSON, 1967; NÜRK et al., 2013).

*Hypericum* sect. *Arthrophyllum* Jaub. & Spach currently comprises six taxa (HYPERICUM ONLINE, 2023), distributed in Turkey and adjacent countries in the South. Species of this section are characterized by their shrubby habits and absence or presence of dark glands on petals and sepals (ROBSON, 1967). Moreover, they have solitary flowers or arranged in corymbiform cymes, persistent petals and stamen fascicles in groups of three, three styles, longitudinally vittate capsule valves, and minutely rugulose seeds. Taxa in this section can be discriminated by the corymbose or solitary inflorescence type, shape of leaf bases, leaves sessile or petiolate, and presence or absence of glands on sepals and bracts (ROBSON, 1967).

During field work in Çelikhán/Adıyaman, southeastern Anatolia, in May–August 2021 and 2022 (Fig. 1), the authors collected several *Hypericum* specimens from Gelera Region on limestone cliffs of an estimated population of 1,000 individuals within three square kilometers. These plants were low and saxatile shrubs with sepals and bracts bearing black glands. On this basis, we place this new species in section *Arthrophyllum*.

## Materials and methods

Specimens of the new species were collected during the flowering and fruiting periods for two consecutive years, with 10 specimens per collection. The specimens were examined using relevant literature (BOISSIER, 1867; ROBSON, 1967, 1996; DÖNMEZ, 2000; YÜCE-BABACAN et al., 2017; BAŞKÖSE & SAVRAN, 2018; DIRMENCI & ROBSON, 2019; ÖZBEK et al., 2019; DUMAN & ÇAKIR-DİNDAR, 2020; ÖZGIŞI & OCAK, 2021). Herbarium specimens were deposited in the herbaria HUB, VANF, and Hb. M. Fırat.

Images of the living material were taken with a Nikon D7200 digital camera. Images of the dried material were taken with a Leica EZ4 microscope. Floral characters were measured using an ocular micrometer. Geographical positions were identified using a Magellan eXplorist 710 GPS. The distribution of the new taxon in Turkey is given according to the grid system of *Flora of Turkey* (DAVIS, 1965).



Fig. 1. – Distribution map of species belonging to *Hypericum* sect. *Arthrophyllum* Jaub. & Spach: *H. cardiophyllum* Boiss. (yellow), *H. celikaensis* Fırat & Eroğlu (red), *H. nanum* Poir. (brown), *H. pamphylicum* N. Robson & P.H. Davis (black), *H. rupestre* Jaub. & Spach (white), and *H. vacciniifolium* Hayek & Siehe (purple).

## Palynological study and seed surface characterization

Pollen and seed surface examinations were made using both light microscope (LM) and scanning electron microscope (SEM). The Wodehouse method was used to examine the pollen grains under the LM (WODEHOUSE, 1935). The pollen grains from the flowers of the specimens collected in the field were poured on a slide and 1 drop of 70% ethanol was dripped on to soften them. Permanent preparations were prepared by taking pollen grains into a gelatin–glycerin mixture colored with 1% safranin after drying. Pollen grains in the prepared preparations were photographed with a Leica DM500 model LM equipped with ICC50HD camera and their measurements were made with the LasEZ program. In order to display the pollen grains under the ZEISS Sigma 300 scanning electron microscope (SEM), pollen was fixed on aluminum plates with the help of conductive double-sided tape and coated with gold–palladium. Images were photographed using the Zeiss Leo 440 SEM. ERDTMAN (1969), WALKER (1974a, b), FAEGRI & IVERSEN (1975), and PUNT et al. (2007) were followed to determine the properties of pollen grains.

To characterize the seeds, these were photographed using both a stereo microscope (Leica EZ4 wit hd camera) and SEM and then analyzed. The stereo microscope was used to analyze the color and size of the seeds, and the SEM photographs to determine the seed surface properties. The relevant literature used to determine the seed surface properties was STEARN (1983) and BOJŇANSKÝ & FARGAŠOVÁ (2007).

## Taxonomy

*Hypericum celikaensis* Firat & Eroğlu, **sp. nov.** (Fig. 2–5).

**Holotype:** TURKEY. ADIYAMAN [C7]: Çelikhan (Cêlika) district, Gelera Region, Sewrike hill (Gaza Sewrikê), 37°58'11"N 38°29'37"E, 924 m, 29.VI.2021, Firat & H. Eroğlu 35631 (VANF!; iso: HUB!, VANF!, Hb. M. Firat!).

*Hypericum celikaensis* Firat & Eroğlu differs from *H. rupestre* Jaub. & Spach by having stem 2-lined (vs. 4-lined), bracteole margin rather entire with lax fringed black glands (vs. margin entire, black glands absent), sepals free at base (vs. 0.4–0.5 of its length fused), sepal margin distally with 2–7 sessile black glands (vs. with 14–22 sessile black glands), and stamens 13–20 (vs. 30–40). *Hypericum celikaensis* differs from *H. cardiophyllum* Boiss. in having stems up to 35 cm (vs. up to 90 cm), pairs of lateral veins (3–)6–10(–15) (vs. 5–6), flower pedicels 2–7 mm (vs. 2–3 mm), bracteole margin rather entire with lax fringed black glands (vs. with black glandular cilia), sepal margin distally with 2–7 sessile black glands (vs. glands submarginal), petals asymmetrically retuse (vs. rounded), laminar glands linear striiform (vs. striiform to punctiform), ovary 3.5–5 × 2–2.5 mm (vs. 1.5–2 × 1–1.5 mm), and seeds 1.5–2.5 mm long, brown (vs. c. 1.2 mm long, yellowish brown).

Shrub up to 35 cm tall, erect, bushy, rounded, with branches erect to ascending. Stems 2-lined, green when young (orange-brown as time passes); cortex loosening and becoming whitish in second year, then bark pale grey. Leaves sessile; lamina 10–40 × 10–30 mm, lanceolate or elliptic to ovate, apex acute, emarginate, obtuse to rounded, base truncate to ± cordate-amplexicaul, thinly coriaceous, deciduous before growth of new shoots, midrib scarcely prominent, (3–)6–10(–15) pairs of lateral veins, scarcely distinct from tertiary reticulation, glaucous especially beneath. Inflorescence corymbiform to broadly hemispherical, c. 5–30-flowered from 1–4 nodes; pedicels 2–7 mm long; bracteoles 1.5–3 mm long, triangular-subulate, margin ± entire with fringed lax black glands. Flowers c. 13–17 mm in diam.; buds elliptic, obtuse to rounded. Sepals 3–5 × 1.2–2.5 mm, unequal to subequal, free, ovate to oblong-lanceolate, acute to subacute or sometimes rounded, entire, margin distally with 2–7 sessile black glands; veins 3–5, subprominent. Petals 8–11 × 4–6 mm (2.5–3.5 × sepals), obovate to elliptic, asymmetrically retuse, bright yellow, not tinged red, with glands linear striiform. Stamens 13–20, 9–13 mm long, as long as petals. Ovary 3.5–4.5 × 2–2.5 mm, narrowly ovoid; styles 8–10 mm long (2–3 × ovary), widely curved-ascending; stigmas narrowly capitate. Capsule 5–7 × 3.5–5 mm, exceeding sepals, very narrowly ovoid to cylindrical, truncate, with persistent horn-like style bases, exceeding sepals. Seeds 1.95–2.64 × 0.29–0.57 mm, cylindrical, reticulate, brown.

**Etymology.** – The specific epithet *celikaensis* is derived from Cêlika (Çelikhan) district where the type material was collected.

**Vernacular name.** – *Hypericum celikaensis* is called “Giya telik” in Kurdish by the local people of Adiyaman Province.

**Distribution.** – *Hypericum celikaensis* is endemic to Çelikhan (Cêlika) district, Gelera Region, Sewrike hill (Gaza Sewrikê) Adiyaman Province, Turkey (Fig. 1). It is an element of the Irano-Turanian floristic region.

**Habitat, ecology and phenology.** – *Hypericum celikaensis* grows on limestone cliffs, at c. 900–1000 m elevation, with other interesting plants such as *Asperula* sp., *Ballota nigra* L., *Chrysophthalmum montanum* (DC.) Boiss., *Ficus carica* L., *Heliotropium myosotoides* Banks & Sol., *Micromeria cristata* (Hampe) Griseb., and *Prunus microcarpa* C.A. Mey.

Flowering period from June to July, fruiting period from July to August.

**Notes.** – *Hypericum celikaensis* is most similar to *H. rupestre* and *H. cardiophyllum*. The new species differs from these two species by several fertile and sterile characters (see Fig. 3, 4; Table 1). Moreover, the habitat and ecology of these three species differ.

The pollen grains of *Hypericum celikaensis* are in monads, isopolar, 3-colporate, prolate-spheroidal [long axis length: 22.59 (± 1.4) µm, short axis length: 20.87 (± 0.8) µm, long axis length/short axis length: 1.08, exine thickness: 0.97 (± 0.09) µm, intine thickness: 0.63 (± 0.06) µm, colpus width: 4.57 (± 1.14) µm]. Ornamentation is perforate-microreticulate, and the colpus membrane ornamentation is rather granulate.

The seeds of *Hypericum celikaensis* are cylindrical, 1.95–2.64 × 0.29–0.57 mm, and brown. Epidermal cells are polygonal shaped. Seed surface ornamentation is reticulate. Anticlinal cell walls are raised, periclinal cell walls are convex or concave. The surfaces of the cells are rather striate.

Studies of pollen and seed surface revealed that the pollen shape of *Hypericum celikaensis* is different from that of *H. rupestre* (prolate-spheroidal vs. subprolate, respectively). The seeds of *H. celikaensis* and *H. rupestre* are similar in shape, color, ornamentation, and size. The only difference is found in the cells of the seed surface (striate in *H. celikaensis* vs. granulate-striate in *H. rupestre*) (Fig. 5).



Fig. 2. – *Hypericum celikaensis* Firat & Eroğlu. A, C, D. Habit; B. Inflorescence and flowers; E. Leaves and venation; F. Habitat. [Photos: M. Firat]

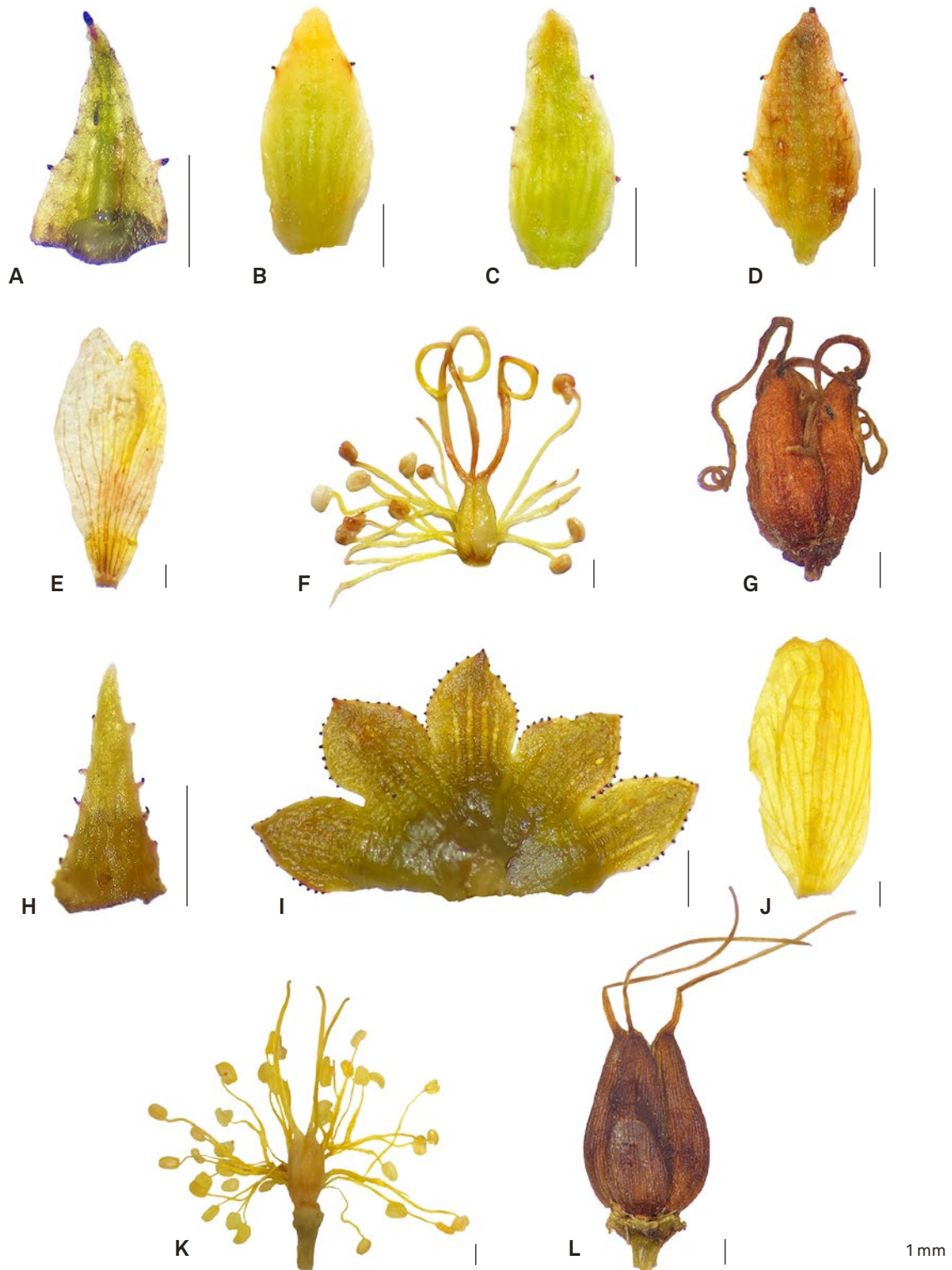


Fig. 3. – Dissected flowers and capsules of *Hypericum celikaensis* Firat & Eroğlu (A–G) and *H. rupestre* Jaub. & Spach (H–L). A, H. Bracts; B–D, I. Sepals; E, J. Petals; F, K. Stamens and ovaries; G, L. Capsules. [A–G: Firat & H. Eroğlu 35631; H–L: Firat & Topal 35654] [Photos: M. Firat]

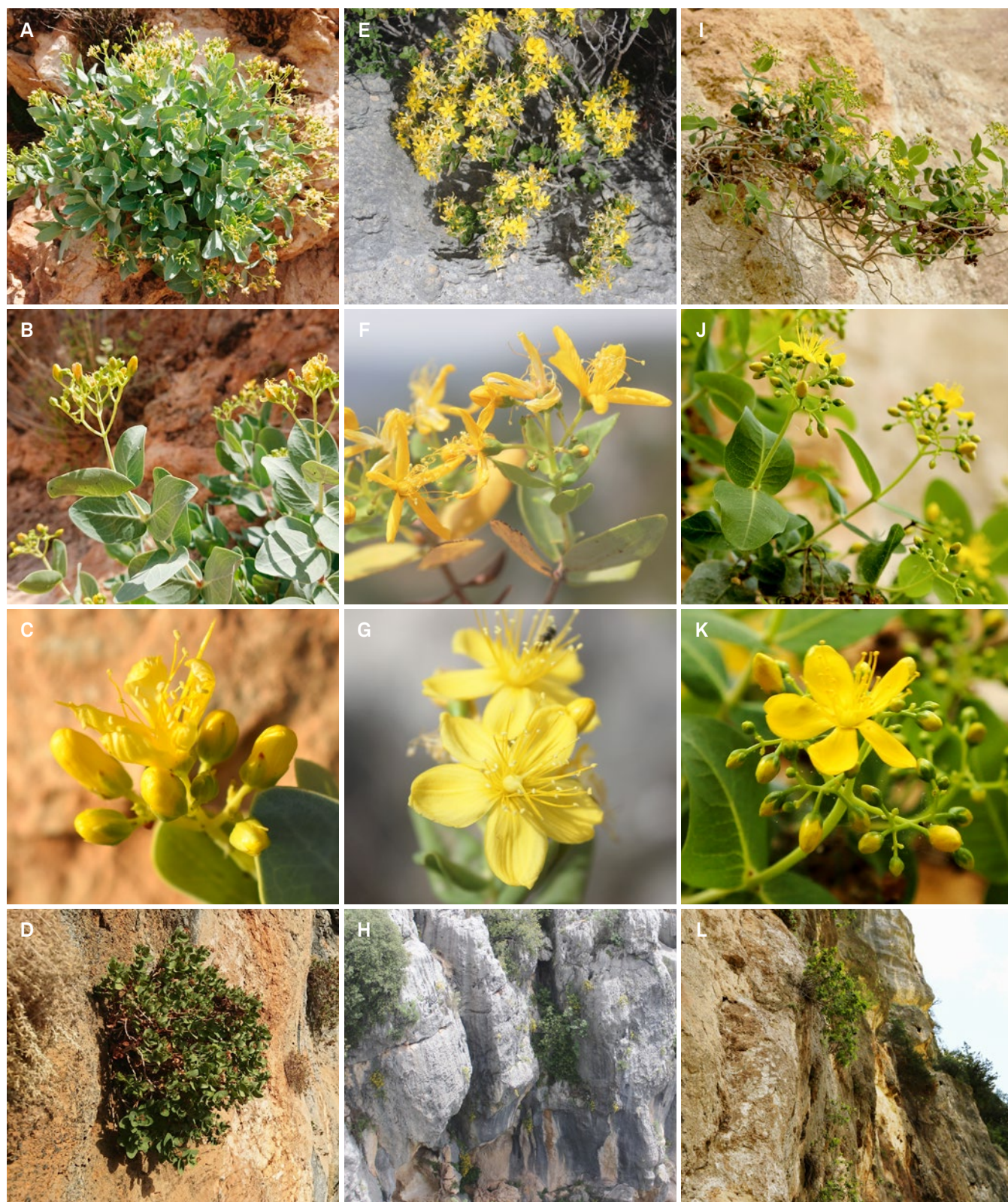


Fig. 4. – *Hypericum celikaensis* Firat & Eroğlu (A–D), *H. rupestre* Jaub. & Spach (E–H), and *H. cardiophyllum* Boiss. (I–L).

A, E, I. Habit; B, F, J. Inflorescences; C, G, K. Flowers. D, H, L. Habitat.

[Photos: A–H: M. Firat; I–L: A. Duran]

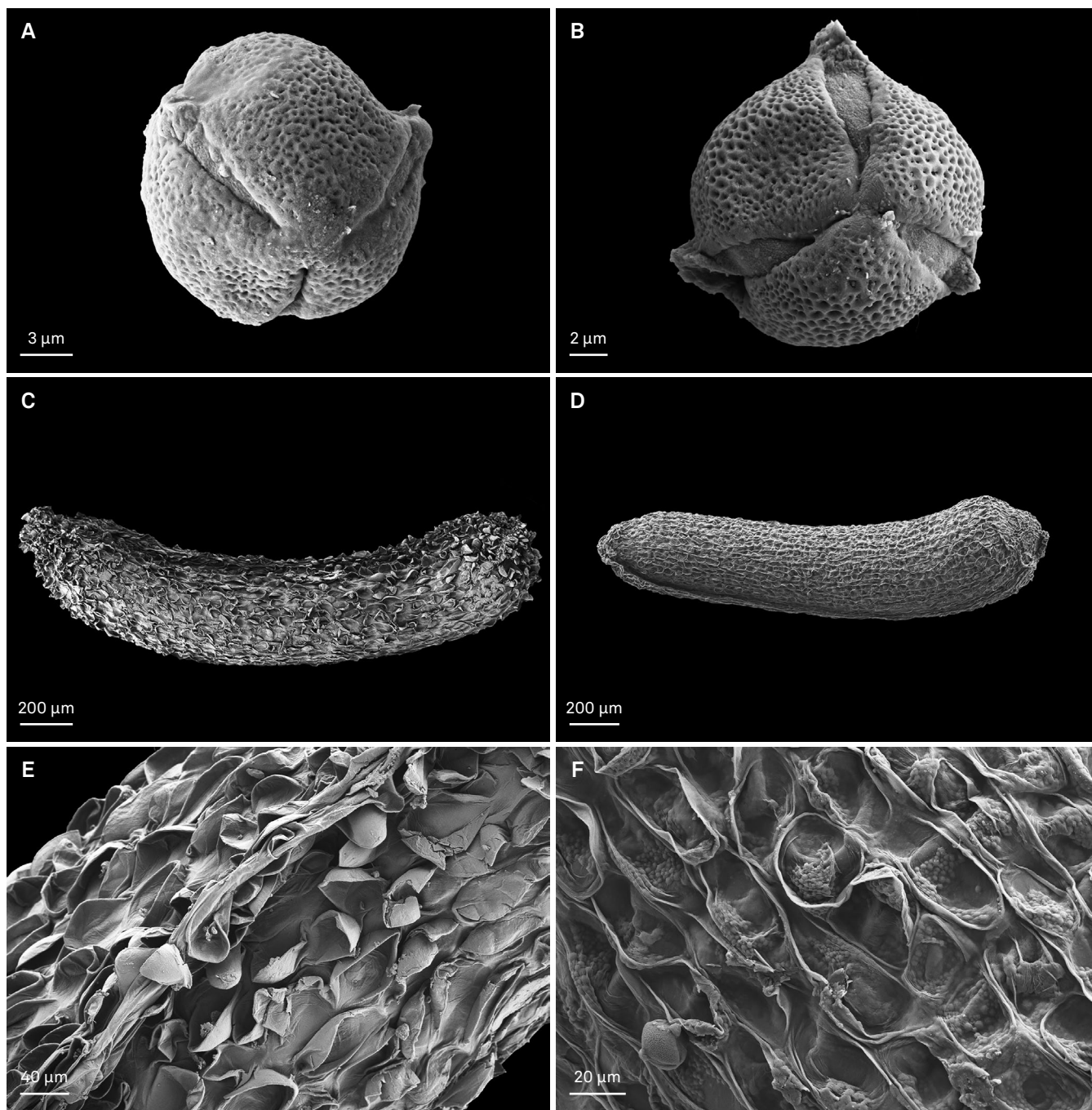


Fig. 5. – SEM micrographs of pollen grains and seeds of *H. celikaensis* Firat & Eroğlu (A, C, E) and *H. rupestre* Jaub. & Spach (B, D, F). A, B. Short axis views of pollen grains; C, D. Seeds; E, F. Close views of seed surfaces. [Photos: M. Firat]



Table 1. Comparison of morphological characters of *Hypericum celikaensis* Firat & Eroğlu and allied species.

|                          | <i>H. celikaensis</i>   | <i>H. rupestre</i>  | <i>H. cardiophyllum</i>  |
|--------------------------|---|---|--|
| <b>Stem [cm]</b>         | up to 35 tall, 2-lined  | up to 30 tall, 4-lined  | up to 90 tall, 2-lined   |
| <b>Leaves [mm]</b>       | lamina 10–40 × 10–30 with (3–)6–10(–15) pairs of veins                              | lamina 17–45 × 9–15 with c. 8–12 pairs of veins                       | lamina (15–)20–45 × 10–30 with 5–6 pairs of veins                                      |
| <b>Inflorescences</b>    | 5–30-flowered from 1–4 nodes, corymbiform to broadly hemispherical; pedicels 2–7 mm | 9–16-flowered from (1–)2(–3) nodes, subcorymbiform; pedicels 2.5–6 mm | 10–40-flowered from 3(–5) nodes, corymbiform to broadly hemispherical; pedicels 2–3 mm |
| <b>Bracteole margins</b> | ± entire with lax fringed black glands  | entire  | ± entire with black glandular cilia  |
| <b>Sepal margins</b>     | distally with 2–7 sessile black glands  | distally with 14–22 sessile black glands                              | with submarginal glands  |
| <b>Petals</b>            | asymmetrically retuse with glands linear striiform                                  | asymmetrically retuse with glands linear                              | rounded with glands striiform to punctiform  |
| <b>Stamens</b>           | 13–20   | 30–40   | 20–30  |
| <b>Ovary [mm]</b>        | 3.5–5 × 2–2.5, ovoid  | 3 × 1.5, ellipsoid  | 1.5–2 × 1–1.5, ovoid   |
| <b>Seeds</b>             | 1.95–2.64 mm long, brown  | 1.56–2.15 long, brown   | c. 1.2 mm long, yellowish brown  |

*Additional specimens examined.* – *Hypericum celikaensis*: TURKEY. Adıyaman [C7]: Çelikhan (Cêlika) distr., Gelera reg., Sewrike hill (Gaza Sewrikê), 37°58'11"N 38°29'37"E, 924 m, 29.VII.2021, fr., *H. Eroğlu & A. Eroğlu 1975* (VANF, Hb. M. Firat); *ibid. loco*, 4.VI.2022, fl., *Firat & Şişman 37011* (VANF, Hb. M. Firat); *ibid. loco*, 28.VIII.2022, fr., *Firat & Şişman 37071* (VANF, Hb. M. Firat).

*Hypericum rupestre*: TURKEY. Mersin [C5]: Tarsus distr., from Çavdarlı village to Ulaş village, 37°03'24"N 34°77'85"E, 253 m, 10.VII.2021, fr., *Firat & Topal 35654* (Hb. M. Firat); *ibid. loco*, 24.IV.2022, fl., *Firat & Topal 36820* (VANF).

## Key to the species of *Hypericum* sect. *Arthrophyllum*

[adapted from ROBSON, 1996]

1. Sepals and bracts with marginal, reddish or black glands ..... 2
  - 1a. Sepals and bracts without marginal glands ..... 4
2. Leaves perfoliate ..... *H. pamphylicum*
  - 2a. Leaves free ..... 3
3. Sepals base free, margin distally with 2–7 sessile black glands ..... *H. celikaensis*
  - 3a. Sepals base 0.3–0.5 of its length fused, margin distally with 14–22 sessile black glands ..... *H. rupestre*
4. Leaves (at least middle and upper) with base cordate-amplexicaul; flowers numerous, in dense corymbiform cymes ..... *H. cardiophyllum*
  - 4a. Leaves all with base cuneate to rounded; flowers 1–9, solitary or in lax corymbiform cymes ..... 5

5. Sepals oblong to ovate, rounded to subacute at apex; leaves chartaceous, with venation prominent on both sides; flowers usually solitary ..... *H. vacciniifolium*
- 5a. Sepals lanceolate, acute to shortly acuminate at apex; leaves subcoriaceous, with venation not or scarcely prominent; flowers usually 2–9 ..... 6
6. Stems erect, plant bushy; leaves ovate to broadly elliptic or orbicular; inner sepals triangular-lanceolate to narrowly oblong ..... *H. nanum* var. *nanum*
- 6a. Stems prostrate, plant appressed; leaves broadly to narrowly elliptic; inner sepals broadly ovate ..... *H. nanum* var. *prostratum*

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