

Hesperis ozcelikii (Brassicaceae), a new species from Turkey

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Hesperis ozcelikii A. Duran *sp. nova* (Brassicaceae) is described and illustrated from South Anatolia, Turkey. The species grows in landslipped places, open forest, roadsides and serpentine, pebbly slopes in Sütçüler (C3 Isparta province). It is closely related to *Hesperis aspera*, an endemic confined to southwest Anatolia. Diagnostic morphological characters, ecology and biogeography of *H. ozcelikii* are discussed. The pollen characteristics and seed coat surface of *H. ozcelikii* and *H. aspera* were examined by SEM. *Hesperis ozcelikii* is diploid with a new chromosome number of $2n = 12$.

Key words: Brassicaceae, *Hesperis*, new species, taxonomy

The genus *Hesperis* (Brassicaceae) is widely distributed in Eurasia. It has almost 60 species throughout the region (Fournier 1866, Tzvelev 1959, Dvořák 1980, Duran *et al.* 2002, Duran 2005, 2008, Duran & Ocak 2005, Al-Shehbaz *et al.* 2006, Parolly & Tan 2006). Most of the species in Anatolia, Turkey, have rather narrow distributions. On the other hand, those occurring in moist areas are more widespread, especially in the Euro-Siberian phytogeographic region.

Hesperis is represented with many taxa at the junctions of the Irano-Turanian, Mediterranean and Euro-Siberian phytogeographic regions. These regions meet in Anatolia. Towards the outer boundaries of each phytogeographic region *Hesperis* is represented by fewer taxa, which is also indicated by the number of *Hesperis* taxa in various floras. In Europe there are 14 species (Ball 1964), 11 in Iran (Dvořák 1968), nine in Romania (Săvulescu 1955), five in Iraq (Dvořák

1980), three in Italy (Pignatti 1982), and one in Palestine (Zohary 1966), while Turkey has 30 species (Duran 2005, 2008, Duran & Ocak 2005, Parolly & Tan 2006).

František Dvořák carried out morphological, cytological and palynological studies on some *Hesperis* species (Dvořák 1964, 1966a, 1966b, 1973, Dvořák & Dadáková 1974). He also described numerous new *Hesperis* taxa, and carried out the generic revisions for *Flora of Iraq* and *Flora Iranica* (Dvořák 1968, 1980). The genus was revised by Cullen (1965) for the *Flora of Turkey*. Seven new species have since been described from Turkey, in addition to four new records for the country (Davis *et al.* 1988, Duran & Ocak 2005, Parolly & Tan 2006). Furthermore, three imperfectly known taxa were recorded by Cullen (1965).

Tribe Hesperideae is unigeneric. It is readily distinguished from the rest of the Brassicaceae

by having stalked glands, with uniseriate stalks terminated with a unicellular gland. Multicellular stalked glands occur in the Chorisporeae and Anchonieae, but in these tribes the stalks are multiseriate and the glands are multicellular (Al-Shehbaz *et al.* 2006).

Some peculiar *Hesperis* specimens with flowers and fruit were collected by Dr. Hasan Özçelik on his botanical trips to Sütçüler district (Isparta province) in 1997. I collected *Hesperis* specimens from the same locality in 1999 and 2000. They were not referable to any known species. After studying the specific descriptions of *Hesperis* in Ball (1964), Busch (1939), Cullen (1965), Davis *et al.* (1988), Dvořák (1968, 1980), Halácsy (1900), Hayek (1927), Pignatti (1982), Săvulescu (1955), Tan and Iatrou (2001), Tzvelev (1959), Zohary (1966), Duran (2005, 2008), Duran and Ocak (2005) and Parolly and Tan (2006) as well as comparing with specimens in AEF, ANK, BM, E, GAZI, HUB, ISTF, K, KNYA, MSB, P, VANF and WU, it became clear that the specimens represent a species new to science. Specimens of the new species were collected both with flower and with fruit.

For palynological studies, pollen samples were taken from the specimens at herbarium KNYA and prepared for light microscopy (Wodehouse 1935), with descriptive terminology from Faegri and Iversen (1975). Measurements with a Nikon E600 microscope were based on 50 samples or more for pollen diameter and ca. 10 for the other features. For SEM study, pollen grains were hydrated with 10% KOH for ca. 10 min., then rinsed with distilled water and dried before mounting and sputter coating with gold for SEM micrographs with a JSM-5600 microscope.

For seed morphology, SEM micrographs were taken with a JSM-5600 microscope. The descriptive terminology follows Brochmann (1992).

For the study of somatic chromosomes, root tips were obtained from germinated seeds, which were pre-treated in α -monobromonaphthalene overnight and then fixed in alcohol: acetic acid (3:1). Roots were hydrolysed in 1 N HCl at 60 °C for 16 min. and Feulgen-stained, and squashes were made in 1% lactopropionic orcein. Permanent slides were made in Depex. Chromosome numbers were based on at least five metaphase plates.

***Hesperis ozcelikii* A. Duran, sp. nova**
(Figs. 1, 2A–C, 3)

Affinis Hesperidi asperae sed caulibus inferne glandiferis vel glandiferis et bifurcates pilis (non simplicibus pilis), pilis ca. 1.5 mm longis (non 2–2.5 mm), foliis basalibus glandiferis et bifurcates-stellaribus pilis (non bifurcates, simplicibus et ramosis pilis), pedicellis pubescentibus (non plerumque glabris), ovariis pubescentibus (non glabris), fructibus 1.6–2.2 mm latis, pubescentibus (non 1–1.5 mm latis, glabris), seminibus 2.4–3.5 mm longis (non 2–2.6 mm) differt.

ETYMOLOGY: This species is named in honour of the Turkish botanist Prof. Dr. Hasan Özçelik (Biology Dept., Süleyman Demirel Univ., Isparta, Turkey).

TYPE: Turkey. C3 Isparta: Sütçüler, 17th km from Ayvalıpınar to Kesme, 1025 m, 37°36.53'N, 31°10.26'E, 11.VI.1999 A. Duran 4636, H. Özçelik & Sağıroğlu (holotype KNYA; isotypes GAZI, ANK, HUB). — PARATYPES: Turkey. C3 Isparta: Sütçüler, 17th km from Ayvalıpınar to Kesme, 1025 m, 37°36.53'N, 31°10.26'E, 4.VIII.1999 A. Duran 4973 (KNYA), 9.VI.2000 A. Duran 5262 & H. Özçelik (KNYA); Isparta: Sütçüler, between Ayvalıpınar-Kesme, 1300 m, 11.V.1997 H. Özçelik 7714 (SDÜH).

Biennial herb. Roots 3–7 mm diam. Stem ascending to erect, 25–60 cm tall, rarely purplish below, solitary or 2–6, branched with flowering part, terete, smooth, 3–12 cm diam. below, pubescent with only densely articulated glandular hairs, or densely glandular, sparsely or a few bifurcate and simple hairs below, only glandular hairs above, long bifurcate-stellate hairs ca. 1.5 mm. Leaves loosely crowded in lower part of stem; basal leaves narrowly elliptic or oblanceolate, 3–8 × 1–2 (–2.5) cm (incl. petiole), lyrate or sinuate-dentate. Petiole 1–3 cm long. Radical leaves acute or subacute, all with main midrib conspicuous, with indumentum of glandular and bifurcate-stellate hairs, or bifurcate-trifid and a few glandular hairs and very rarely a few simple hairs; cauline leaves acropetally decreasing, glandular and bifurcate-stellate hairs; middle cauline leaves elliptic, or oblanceolate, petiolate or sessile, attenuated into petiole, generally lyrate or sinuate-dentate, \pm acute; upper cauline leaves elliptic, oblong to lanceolate, sessile or sessile sometimes semiamplexicaul, sinuate-dentate or serrate, acute or acuminate. Inflorescence generally simple a raceme, rarely with

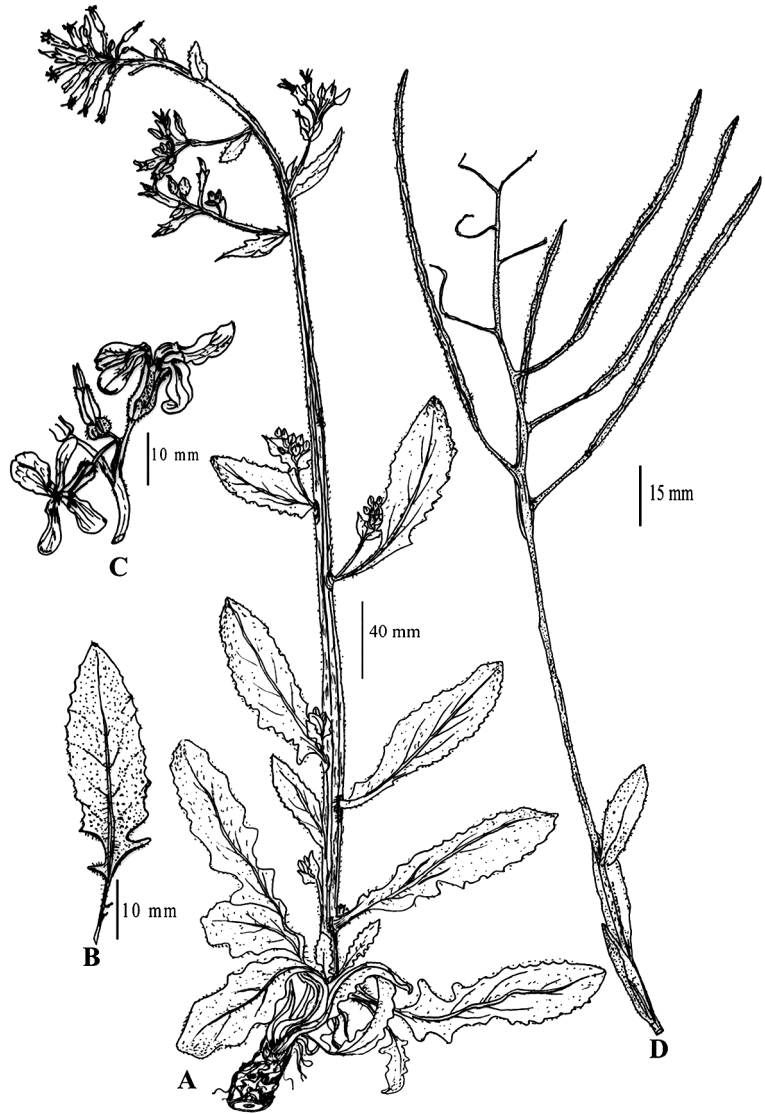


Fig. 1. *Hesperis ozcelikii* (from the holotype). — **A:** Habit. — **B:** Leaf. — **C:** Flowers. — **D:** Fruits.

branched, branches ascending to erect, 4–35 × 3–15 cm, all flowers ebracteate. Pedicels ascending, slender, 5–20 mm long at anthesis, elongating to 25 mm long at most in fruit, with only densely glandular, or rarely bifurcate-stellate and glandular hairs. Sepals partly or entirely light lilac, oblong, deciduous, with 7–10 veins, 8–10 × 1.8–2.2 mm, densely glandular, sparsely bifurcate-stellate and rarely simple hairs, with membranous margins, inner sepals strongly saccate. Petals narrowly oblanceolate, 20–24 × 4–5.5 mm, violet, veins slightly conspicuous; limb narrowly oblanceolate to spatulate, tapering gradu-

ally into claw, 9–12 mm, obtuse or rounded, ± horizontal; claw 9–12 × 1.5–2 mm, claw exerted from sepal. Outer filaments not dilated at base, 2.7–4.3 mm long; inner filaments dilated at base, 5–7.6 mm long, whitish; anthers all fertile, linear or linear-lanceolate, 3.5–4 mm long, greenish, basifixed. Stigma with two obtuse, decurrent carpoid lobes. Ovary hairy. Fruiting pedicels slightly thickened, ca. 1 mm diam. Siliquae (30–)40–80(–120) × 1.6–2.2 mm, terete, dehiscent, slightly torulose, straight or slightly curved, ascending to erect, densely glandular, sparsely bifurcate and rarely a few simple hairs, greenish

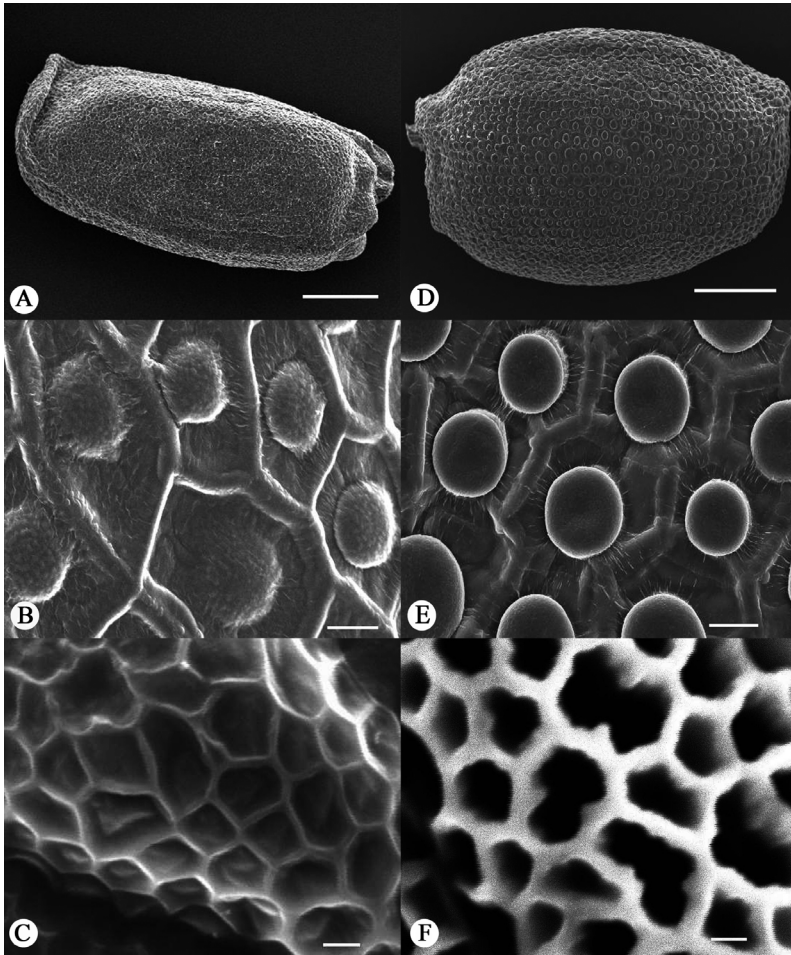


Fig. 2. SEMs micrographs of seed coat surfaces and pollen grains. — **A–C:** *Hesperis ozcelikii* (from A. Duran 4973). — **A:** General shape. — **B:** Seed coat surface. — **C:** Wall detail of pollen grain. — **D–F:** *H. aspera* (from A. Duran 5657). — **D:** General shape. — **E:** Seed coat surface. — **F:** Wall detail of pollen grain. — Scale bar: **A** and **C** = 500 μm , **B** and **D** = 20 μm , **E** and **F** = 1 μm .

to yellowish; valves longer than septum; septum almost membranous, with invisible median veins. Seeds dark brown, $2.4\text{--}3.5 \times 1\text{--}1.4$ mm, 5 to 29 in number. Flowering May–June, fruiting June–July. Chromosome number: $2n = 12$ (examined from isotype).

Chromosome numbers of *Hesperis* taxa are reported as $n = 6, 7, 8, 12, 14, 16, 20, 24$ and $2n = 12, 14, 16, 24, 28$ (Manton 1932, Khosravi & Maassoumi 1998, Warwick & Al-Shehbaz 2006). Chromosome counts for *Hesperis ozcelikii* reveal a diploid count of $2n = 12$ (A. Duran 4973), which corresponds to the base number for sect. *Hesperis* (Fig. 4). Chromosome numbers of the related species in sect. *Hesperis* are $2n = 14$ in *H. aspera*, $2n = 14, 28$ in *H. bicuspidata*, $2n = 14, 24, 28$ in *H. matronalis* subsp. *matronalis*, $2n = 12, 14, 16$, in *H. sylvestris* subsp. *sylves-*

tris, and $2n = 14$ in *H. velenovskyi*, *H. sibirica*, *H. matronalis* subsp. *adzharica*, *H. steveniana*, and *H. pycnotricha* (Löve & Löve 1956, 1961, Dvořák & Dadáková 1974, Warwick & Al-Shehbaz 2006).

DISTRIBUTION AND HABITAT ECOLOGY: *Hesperis ozcelikii* is an endemic species restricted to South Anatolia (Isparta province) and of East Mediterranean element. It grows in landslipped places, open forest, roadsides and serpentine pebbly slopes with *Pinus nigra*, *Juniperus excelsa*, *J. oxycedrus*, *Arabis caucasica*, *Erysimum gonio-caulon*, *Pistacia terebinthus*, *Quercus cerris*, *Q. coccifera*, *Potentilla kotschyana*, *Bromus tectorum*, *Briza humilis*, and *Dactylis glomerata*, at 1000–1300 m altitude.

Hesperis ozcelikii, which is morphologically closest to *H. aspera* (see Table 1), grows in the

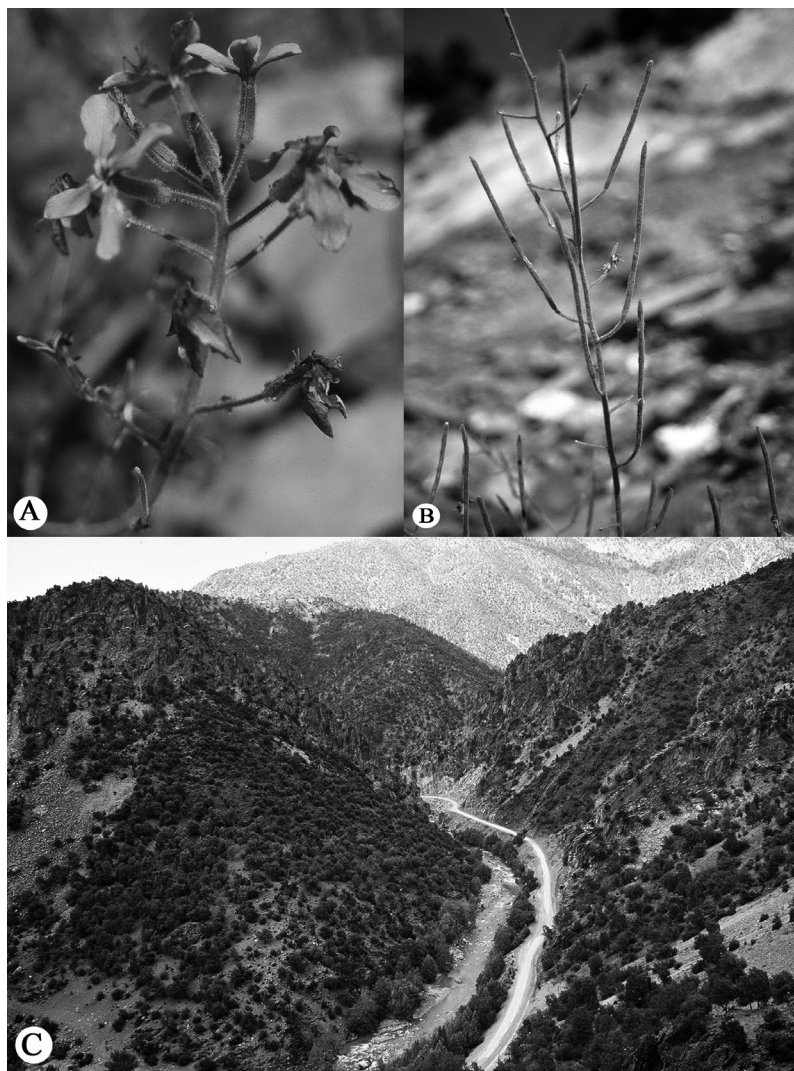


Fig. 3. *Hesperis ozcelikii* at its type locality in Isparta province, South Anatolia, Turkey. — **A:** Flowering branch. — **B:** Fruits. — **C:** Aksu Valley.

serpentine pebbly valleys of the Aksu River, where Mediterranean climate prevails. It forms vulnerable populations especially in landslipped places and roadsides. The populations are threatened by over-grazing and are gradually decreasing. In some years they are completely eaten up before producing any fruit.

SEED COAT AND POLLEN CHARACTERISTICS. The seed surfaces of *Hesperis ozcelikii* and *H. aspera* differ. The surface ornamentation in *H. ozcelikii* is reticulate-verrucate. The reticulum wall is thick (12.7–17.4 μm), with undulations traversing the interspaces, and lengthwise polygonal in shape (Fig. 2A–C). The wart is granulate (A.

Duran 4973). In *H. aspera* the surface ornamentation is reticulate-verrucate. The reticulum wall is thin (9.7–10.4 μm), with undulations traversing the interspaces, and is polygonal in shape (Fig. 2D–F). The wart is smooth (A. Duran 5822). *Hesperis ozcelikii* has a thicker reticulum wall than *H. aspera*. The shape of muri in *H. ozcelikii* is lengthwise polygonal, but regularly polygonal in *H. aspera*. *Hesperis ozcelikii* and *H. aspera* also differ in their pollen characteristics (Fig. 2C and F, Table 2).

The West Taurus Mountains, which connect the regions of Isparta, Antalya and Konya provinces have numerous national parks.

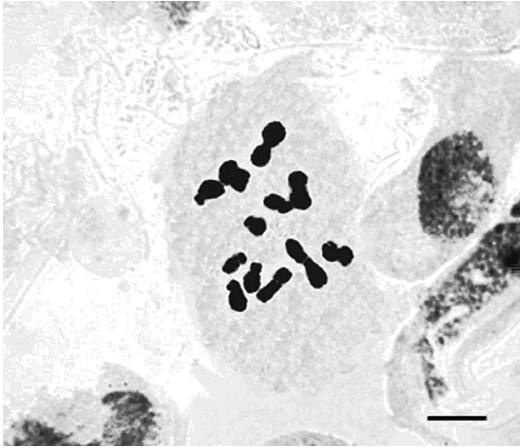


Fig. 4. Somatic metaphase chromosomes of *Hesperis ozcelikii* (from A. Duran 4973). Scale bar = 10 μm .

They include Kızıldağ, Kovada Gölü, Köprülü Kanyon, Altınbeşik Mağarası, Beyşehir Gölü and surrounding regions, and due to the rich local endemism they are botanically interesting. Twenty taxa new to science have recently been identified in the region (Davis 1971, Güner *et al.* 2000, Özhatay & Kültür 2006). *Hesperis ozcelikii* is very narrowly distributed in Sütçüler district (Isparta province) (Fig. 5).

Hesperis ozcelikii is also somewhat similar to *H. schischkinii*, which is spread in Erzurum, Bayburt, Gümüşhane, Sivas, Erzincan, Muş, and Bingöl provinces of East Anatolia. The new species is only distributed in South Anatolia (Isparta province), and endemic for Turkey (Cullen 1965) (Fig. 5). *Hesperis schischkinii*

Table 1. Diagnostic characters of *Hesperis ozcelikii* from *H. aspera*.

Characters	<i>Hesperis ozcelikii</i>	<i>Hesperis aspera</i>
Life form	biennial	perennial or rarely biennial
Stems	25–60 cm tall, rarely purplish below	45–110 cm tall, generally purplish below
Stem pubescence	with only densely articulated glandular hairs, or densely glandular, sparsely bifurcate hairy below	hispid, especially below, simple hairs below
Hairs length	ca. 1.5 mm	2–2.5 mm
Radical leaves	acute or subacute, glandular and bifurcate-stellate hairy or with bifurcate-trifid and a few glandular hairs	obtuse, densely bifurcate and sparsely hairy or with a few simple 3–4-branched hairs
Pedicels	5–20 mm long at anthesis, elongating to 25 mm at most in fruit, with dense, glandular hairs	very graceful, 12–22 mm long at anthesis, elongating to 28 mm at most in fruit, mostly glabrous or rarely sparsely hairy
Sepals	8–10 mm, densely glandular, sparsely bifurcate-stellate hairy	7–8.5 mm, bifurcate and a few trifid hairs
Ovary	hairy	glabrous
Fruiting pedicels	slightly thickened, ca. 1 mm diameter	not thickened, graceful, 0.4–0.5 mm diameter
Siliquae	1.6–2.2 mm wide, densely glandular, sparsely bifurcate hairy	1–1.5 mm wide, glabrous
Valve	longer than septum	slightly narrower than septum
Seeds length	2.4–3.5 mm	2–2.6 mm
Reticulum shape	lengthwise polygonal	regularly polygonal
Pollen shape	oblate-spheroidal	subprolate-spheroidal
Aperture type	tricolpate	syncolpate
Distribution	South Anatolia	North Anatolia

Table 2. Pollen morphology of *Hesperis ozcelikii* and *H. aspera* (values in μm)

Taxa	Polar axis	Equatorial axis	Pollen shape	Thickness		Ornamentation			Aperture type
				Intine	Exine	Shape	Muri width	Lumina width	
<i>H. ozcelikii</i>	16.6–19.8	17.7–20.8	oblate-spheroidal	0.5	1.6	reticulate	0.25	2	tricolpate
<i>H. aspera</i>	18.4–22.1	12.2–15.1	subprolate-spheroidal	0.3	1.5	reticulate	0.12	0.75	syncolpate

mainly differs from *H. ozcelikii* in having stems densely glandular, with sparse furcate-stellate and simple hairs below, and glandular hairs c. 3 mm long; pedicels graceful, elongating to 35 mm in fruit; sepals 5.5–8 mm long; petals narrowly lanceolate, reddish-violet; limp narrowly obovate, 3.5–4 mm wide, obtuse, \pm horizontal; claw clearly longer than sepal; fruiting pedicels unthickened, 0.6–0.8 mm diameter; siliquae slightly flattened; and valves equaling or narrower than septum.

Hesperis pisidica on the other hand is distinguished from *H. ozcelikii* by being mostly perennial; stems generally canescent and hispid especially below, furcate-stellate, simple and stalked glandular hairs, simple hairs 2–3.5 mm long; leaves \pm entire, attenuated at base, obtuse or acute, stellate-furcate, glandular and especially in petiole simple hairs; petiole 1.5–7.5 cm long; pedicels 4–12 mm long at anthesis, furcate-stellate, simple and glandular hairs; sepals 2.4–4 mm wide; petals oblong-obovate or obovate-spathulate, 23–28 mm long; limp obovate-spathulate, tapering gradually or suddenly into the claw, 10–15 \times 6.5–11 mm; claw 10–14 mm long; ovary glabrous; fruits glabrous. It grows in calcareous stony places and open *Cedrus libani* forest. This species is only distributed in Antalya province (Fig. 5).

REPRESENTATIVE SPECIMENS EXAMINED: — *Hesperis aspera*: **Turkey**. Herbarium de Mr. Benj. Delessert, *Aucher 109* (Type. G, photo!); A5 Kastamonu: Tosya-Sekiler köyü arası, *A. Duran 5657 & Hamzaoğlu* (KNYA), *A. Duran 5822 & Menemen* (KNYA); A4 Kastamonu: Tossia (Tosya) prope Karkun in Elmalu Dagh, *Sint. 3867* (WU, BM, K, ANK); Anatolia, *Wiedemann* (K). — *Hesperis schischkini*: **Turkey**. A9 Erzurum: Horasan, *D. 29375 & Hedge* (E, ANK); A7 Giresun: Şebinkarahisar-Suşehri arası, *A. Duran 5247 & Kandemir* (KNYA); Gümüşhane: Şiran-Tersum Dağı-Gümüşhane yolu, *A. Duran 6191, Hamzaoğlu & Sağıroğlu* (KNYA); A8 Erzurum: Kop Da., Aşkale to Bayburt, *Hub.-Mor. 10970*; Erzurum: Erzurum'un 45 km KB'sı, Serçe meşesi, *A. Tatlı 4322* (HUB); A9 Erzurum: Horasan-Erzurum, *A. Duran 5213 & Hamzaoğlu* (KNYA); B7 Erzincan: Erzincan-Kelkit yolu, Pöske Dağı, *A. Duran 5234* (KNYA); Erzincan: Refahiye-Erzincan yolu, Refahiye çıkışı, *A. Duran 5248* (KNYA); B8 Erzincan: Tercan-Aşkale, *D. 29348 & Hedge* (BM, K, ANK); Bingöl: Karlıova, Şoçar deresi vadisi, *A. Engin 1069*; Erzurum: Ilıca-Aşkale arası, Kandilli yol kavşağı, *A. Duran 6177* (KNYA). — *Hesperis pisidica*: **Turkey**. C2 Burdur: distr. Tefenni, Eldikrek Dağ, S. ob Dirmil, *Huber-Morath 8558* (holotype G, photo!); Antalya: in rupestribus regionis alpinis montis Ak-Dağ, VII.1860, *E. Bourgeau* (holotype of *H.*

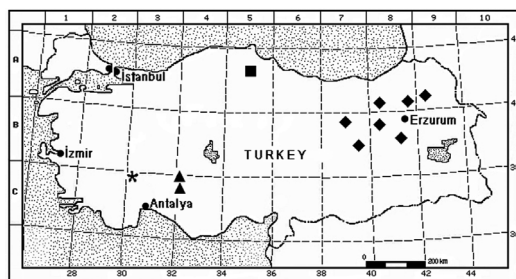


Fig. 5. Distribution map of *Hesperis ozcelikii* (▲), *H. aspera* (■), *H. pisidica* (★) and *H. schischkini* (◆) in Turkey.

pseudoarmena, W); Muğla: Babadagh nach Minor, *Luschan 659* (WU); Antalya: Elmalı, Kızlar sivrisi, *A. Duran 4613 & Sağıroğlu* (KNYA); Antalya: Finike, Gömbe yaylası, Ak Dağ, *A. Duran 4623 & Sağıroğlu* (KNYA); Antalya: Elmalı, Gedik Çukuru giderken, *Çetik 1724* (KNYA); Antalya: Elmalı, Çıglikara and Kuğu Dağı S of Elmalı, 15.VI.1969 *K. Fitz s.n.* (EGE); Antalya: Elmalı, Tekke-Çıglikara yolu, *H. Duman 5763* (KNYA); Antalya: Elmalı, Sedir araştırma ormanı, *Ö. Eren 3942* (KNYA); Muğla: Karaçam orman altı, *Y. Akman 7457* (ANK); C3 Antalya: Bakırlı Dağı, Saklıkent'in güneybatısı, *A. Duran 5802 & Ö. Eren* (KNYA).

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