

*Heracleum kurdicum* sp. nov. (Apiaceae),  
a new species from Hakkari (Turkey)

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ISSN (imprimé / print): 1280-8571/ ISSN (électronique / electronic): 1639-4798

# *Heracleum kurdicum* sp. nov. (Apiaceae), a new species from Hakkari (Turkey)

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Submitted on 4 March 2024 | accepted on 8 July 2024 | published on 19 December 2024

Firat M. 2024. — *Heracleum kurdicum* sp. nov. (Apiaceae), a new species from Hakkari (Turkey). *Adansonia*, sér. 3, 46 (21): 223-237. <https://doi.org/10.5252/adansonia2024v46a21>. <http://adansonia.com/46/21>

## ABSTRACT

*Heracleum kurdicum* Firat, sp. nov. (Apiaceae), a new species is described from Hakkari province, Turkey. From a morphological point of view, the new species appears to be similar to *Heracleum rawianum* C.C.Towns., from which it differs in several morphological features including plant height, leaves and leaflets size and shape, rays number and length, number, size, indumentum of bracts and bracteoles, flowers number, indumentum of fruit, cross sections of mericarp, dorsal and commissural vittae number etc. A comprehensive description of the newly described species is provided, including detailed photographs, geographical distribution map, habitat and ecology, vernacular name and IUCN conservation status.

## KEY WORDS

Turkey,  
Hakkari,  
*Heracleum*,  
endemic,  
new species.

## RÉSUMÉ

*Heracleum kurdicum* sp. nov. (Apiaceae), une espèce nouvelle de la province de Hakkari, Turquie. Une espèce nouvelle, *Heracleum kurdicum* Firat, sp. nov. (Apiaceae), est décrite de la province de Hakkari, Turquie. D'un point de vue morphologique, la nouvelle espèce semble être similaire à *Heracleum rawianum* C.C.Towns., dont elle diffère par plusieurs caractéristiques morphologiques, notamment la hauteur de la plante, la taille et la forme des feuilles et des folioles, le nombre et la longueur des rayons, le nombre, la taille, l'indument des bractées et des bractéoles, le nombre de fleurs, l'indument des fruits, les sections transversales du méricarpe, le nombre de vittae dorsales et commissurales, etc. Une description complète de l'espèce nouvellement décrite est fournie, y compris des photographies détaillées, une carte de distribution géographique, l'habitat et l'écologie, le nom vernaculaire et le statut de conservation de l'UICN.

## MOTS CLÉS

Turquie,  
Hakkari,  
*Heracleum*,  
endémique,  
espèce nouvelle.

## INTRODUCTION

The Umbelliferae family a total of 281 genera of have been recorded for the Asian continent (out of 469 known genera in the world) (Pimenov & Leonov 2004). The genus *Heracleum* L. contains approximately 120-130 species (Ostroumova 2019). The Caucasus and Sino-Himalayan regions are the main centers of diversity for *Heracleum* (Pimenov & Leonov 1993; Pu & Watson 2005; Logacheva *et al.* 2008). The Caucasus (with 30 species), the Sino-Himalayan region (with 25 species), and Iran (with 11 species) are the main areas of its diversification and speciation (Pimenov & Leonov, 2004). With the recently published species of *Heracleum kurdistanicum* Rastegar, Maroofi & Tabad, the number of *Heracleum* species in Iran is now 12 (Tabad *et al.* 2021). *Heracleum* is not monophyletic according to the results of phylogenetic studies (Liu & Downie 2019). The main differences between *Heracleum* and *Tetrataenium* are as follows: the former genus has a white corolla (vs yellowish or yellow in the latter), outer flowers of the umbel with outer petals enlarged (vs symmetric flowers), secretory ducts in the pericarp solitary (vs paired) (Kljuykov *et al.* 2021). Hosseinzadeh *et al.* (2019) reported that the taxon *Heracleum lasiopetalum* Boiss. shown as one of the *Heracleum* taxa found in Turkey is actually the synonym of *Tetrataenium lasiopetalum* (Boiss.) Manden. It is represented in Turkey by 22 taxa (17 species), ten of which are endemic (Davis 1972; Tkachenko 1993; Duran 2012). Güzel & Kayıkçı (2017) rediscovered *Heracleum amanum* Boiss. ex Kotschy & Boiss. after 150 years and the number of species in Turkey increased from 18 to 23 taxa and 11 species are endemic.

During field exploration carried out in 2001-2023 in Bala plateau of Cilo mountain region (eastern Türkiye), an unusual population of *Heracleum* was discovered. At first glance, it seemed to be similar to *Heracleum rawianum* C.C. Towns. but important differences (e.g. plant habit, plant height, including rays length, shape of bracts and bracteoles, length of fruit, etc.) allowed easy separation. A detailed examination

of the collected specimens revealed a combination of morphological characters not found in any other known species in the genus, and therefore it is described below as *Heracleum kurdicum* Firat, sp. nov.

## MATERIAL AND METHODS

The specimens from Bala plateau, Hakkari province Turkey, gathered in 2004, 2011, 2012, 2014, 2018, 2022 and 2023, were cross-checked with the identification keys provided by Mandenova (1951) in the flora of URSS, Davis (1972) in the flora of Turkey, Mandenova (1987) and Mozaffarian (2007) in the Flora Iranica and Townsend (2013) in the Flora of Iraq. And additionally the following necessary source of supply has been checked (Boissier 1872; Davis *et al.* 1988; Duman 2000). Herbarium specimens from Van Flora Application and Research Center and Van Yüzüncü Yil University Faculty of Education (VANF and VHLV, acronyms according to Thiers 2023) were also examined and compared.

Images of the living material were taken with a Sony DSCR1 digital camera. Geographical coordinates were identified using a Magellan eXplorist 710 GPS. According to the grid system (Davis 1965) this new species grows in the C9 square (Fig. 1). A total of 10 herbarium specimens of the new species were collected from three adjacent localities and deposited in the herbaria VANF, VHLF and in the personal herbarium of the author (Herb. M. Firat). The conservation status of the new species was assessed according to the IUCN criteria (IUCN 2017).

Fruit cross sections were taken manually. Due to its composition, Sartur reagent stains woody and corky tissues, oil and starch accumulated areas well and can accomplish this task with a single staining without the need for double or triple staining (Çelebioğlu & Baytop, 1949). Fruit cross-sections were stained with sartur reagent, as it enabled clear visualization of mericarp sections in Apiaceae members in previous studies (Ecevit-Genç 2014; Eroğlu *et al.* 2017).

TABLE 1. — Morphological differences between *Heracleum kurdicum* Firat, sp. nov. and *H. rawianum* C.C.Towns. \*, Townsend (2013).

Characters	<i>Heracleum kurdicum</i> Firat, sp. nov.	<i>Heracleum rawianum</i> C.C.Towns.*
Plant height	60-100 cm	6-35 cm
Basal leaves	oblong to elliptic in outline 20-55 × 6-17 cm petiolulate or sessile, terminal segments ovate to orbicular, 3-9 × 2-8 cm, crenate-dentate at margin	oblong in outline, 4-9 (-20) cm long sessile, lanceolate-ovate leaflets which are further deeply incised with lanceolate
Leaflets	minutely hairy on both sides	glabrous or finely and shortly hairy
Leaves indumentum	7-14, 5-16 cm	2-5, 1.5-4.5 cm
Rays number/length	absent or 1, 5-10 × 0.5-1.5 mm, linear-lanceolate, sparsely hairy	absent or of 2 or 3 very small and caducous
Bracts	7-9, linear to subulate, unequal 1-5 mm long, sparsely hairy, not shorter than pedicels	4-8, linear, very short, much shorter than pedicels
Bracteoles	18-30 in each umbellule, polygamous, with 5-16 mm long, unequal, hairy pedicels	partial umbels 8-12-flowered
Flowers	strongly radiant; radiant petals ovate, c. 5 mm long, deeply bilobed, lobes ± incurved at apex	shortly radiant, ± 3 mm
Petals	9-12 × 6-9 mm, elliptic to obovate, strongly dorsally compressed, pubescent	ovoid or obovoid, 8-10 × 4-8 mm, glabrous on both faces when mature
Fruits	4, about 1/2-1/3 the length of the fruit	4, about 1/3 the length of the fruit
Dorsal vittae	2 or 1	2
Commissural vittae		

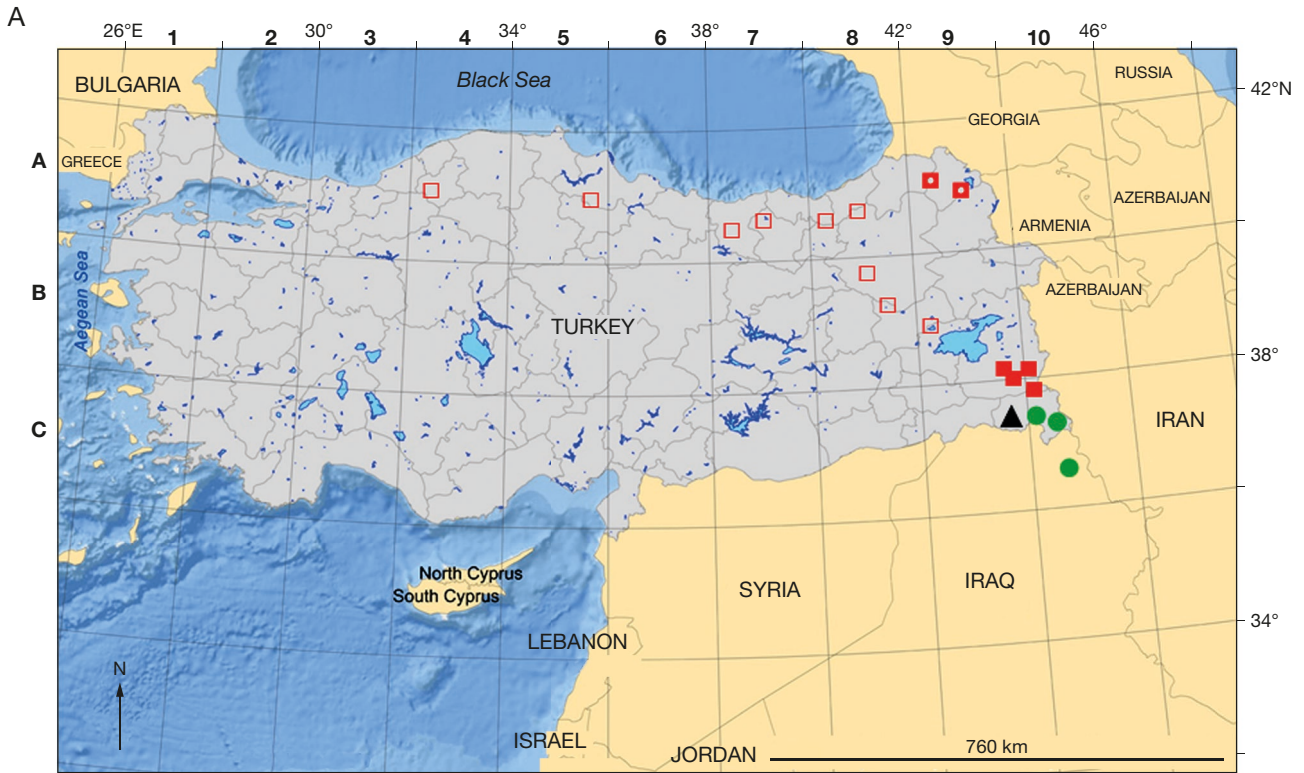


FIG. 1. — **A**, Distribution map of: **black triangle**, *Heracleum kurdicum* Firat, sp. nov. in Turkey; **green circle**, *Heracleum rawianum* C.C.Towns in Turkey and Iraq; **red square**, *Heracleum pastinacifolium* subsp. *pastinacifolium* C.Koch; **yellow inverse bullet**, *Heracleum pastinacifolium* subsp. *transcaucasicum* (Menden.) P.H.Davis; **red hollow square**, *Heracleum pastinacifolium* subsp. *incanum* (Boiss. & A.Huet) Davis; **B**, general habitat of *Heracleum kurdicum* Firat, sp. nov. (Bala plateau and Cilo mountain).

## RESULTS

Family APIACEAE L.  
Genus *Heracleum* L.

*Heracleum kurdicum* Firat, sp. nov.  
(Figs 2-10)

TYPE MATERIAL. — Turkey • C9 Hakkari, Bala plateau; 37°32'08"N, 43°56'39"E; dry and slightly moist meadows; 2747 m a.s.l.; 20.VII.2013; *M. Firat 30271*; holo-, VANF!; iso-, VHLV! and Herb. M. Firat!).

DIAGNOSIS. — *Heracleum kurdicum* Firat, sp. nov. resembles *Heracleum rawianum* C.C. Towns., but it clearly differs by its stem, 60-100 cm tall (not 6-35 cm); basal leaves oblong to elliptic in outline 20-55 × 6-17 cm (not oblong in outline, 4-9[-20] cm long); rays number and length 7-14, 5-16 cm (not 2-5, 1.5-4.5 cm long); flowers 18-30 in each umbellule (not 8-12).

PHENOLOGY. — Flowering from June to July, fruiting from July to August.

ETYMOLOGY. — This plant species is named after the Kurdish people who have inhabited this region (Kurdistan) since the earliest times of history.

DISTRIBUTION. — *Heracleum kurdicum* Firat, sp. nov. is endemic to east Anatolia (Hakkari), Turkey. It is an element of the Irano-Turanian floristic region (Fig. 1).

VERNACULAR NAME. — *Heracleum kurdicum* Firat, sp. nov. is called "Suha piltani" in Kurdish by the local people of Hakkari province, but *Heracleum* species are known by the local people under many names in Kurdish, e.g. "Giyajehrik", "Helerg", "Lerg", "So", "Soy", "Şabilxan", "Zirgêjnok", "Kilir", "Salêw", "Gulper", "Sulan", "Telkxaş" (Firat 2013).

HABITAT AND ECOLOGY. — *Heracleum kurdicum* Firat, sp. nov. grows in dry and slightly moist meadows areas (Fig. 1B), at c. 2700-2800 m elevation, with other interesting plants such as, *Eryngium bornmuelleri* Nab., *Chaerophyllum macrospermum* (Sprengel) Fisch. & Mey, *Silene vulgaris* (Moench) Garcke var. *commutata* (Guss.) Coode & Cullen, *Crepis hakkarica* Lamond, *Trifolium* sp., *Rumex ponticus* E. H. L. Krause, *Campanula persica* A. DC.

IUCN RED LIST ASSESSMENT. — The distribution area of *Heracleum kurdicum* Firat, sp. nov. is less than 10 km<sup>2</sup>. The species is known from one locality, in which c. 1000 individuals were counted. Some anthropogenic or grazing effects were observed on the population. Based on the above data, the IUCN (2017) red list category for *Heracleum kurdicum* Firat, sp. nov. is suggested as "Critically Endangered".

PARATYPES. — Turkey • C9 Hakkari, Bala plateau; 37°32'08"N, 43°56'39"E; dry and slightly moist meadows; 2747 m a.s.l.; 17.VII.2004; *M. Firat 7165*; HUB! and Herb. M. Firat! • *ibid.*; 24.VII.2011; *M. Firat 27200*; HUB! and Herb. M. Firat! • *ibid.*; 29.VII.2012; *M. Firat 28879*; Herb. M. Firat! • *ibid.*; 11.VII.2014; *M. Firat 31181*; VHLV! and Herb. M. Firat! • *ibid.*; 8.VII.2018; *M. Firat 34046*; VHLV! and Herb. M. Firat! • *ibid.*; 23.VII.2022; *İ. Genç, G. Ecevit-Genç & M. Firat 36155*; VANF! and Herb. M. Firat! • *ibid.*; 11.VIII.2023; *M. Firat 40103*; ANK and Herb. M. Firat!

ADDITIONAL SPECIMENS EXAMINED. — *Heracleum pastinacifolium* subsp. *pastinacifolium*: Turkey • B9 Van, Başkale district, Mor Moun-

tains; dry and slightly moist meadows; 2435 m a.s.l.; 30.VII.2014; *M. Firat 30333*; Herb. M. Firat!

*Heracleum rawianum*: Turkey • B9 Van, Bahçesaray, Kavuşşahap Mountains, rocky slopes; 3200 m a.s.l.; 19.VIII.2004; *M. Firat 7903*; Herb. M. Firat! • *ibid.*; 23.VII.2022; *İ. Genç & G. Ecevit-Genç M. Firat 36159*; Herb. M. Firat! • B9 Van, Çatak, Kavuşşahap Mountains, rocky slopes; 3300 m a.s.l.; 10.VIII.2013; *M. Firat 30333*; Herb. M. Firat! • *ibid.*; 15.VIII.2023; *M. Firat 40121*; Herb. M. Firat!

## DESCRIPTION

Perennial, tap-rooted. Stem 60-100 cm tall, erect, branched from middle and upper part, striate or grooved, slender, 2-7 mm in diameter at base, pubescent below, becoming sparsely pubescent to glabrous above. Basal leaves oblong to elliptic in outline, 20-55 × 6-17 cm (incl. petioles), 1-pinnate with 2-5 pairs of leaflets petiolulate or sessile, terminal segments ovate to orbicular, 3-9 × 2-8 cm, crenate-dentate at margin, minutely hairy on both sides. Petioles 5-9 cm, with a 1-2 cm sheath in basal leaves and a longer (2-3 cm) sheath in lower and middle cauline leaves. Cauline leaves similar to basal leaves, reduced to flowering part; lower and middle cauline leaves 1-pinnate, 10-28 × 3-9 cm, leaflets mostly sessile. Upper cauline leaves few, almost reduced to a 1-3 cm sheath. Synflorescence composed of long-pedunculate compound umbels with unequal, sparsely hairy, 5-16 cm long, 7-14 rays. Bracts absent or 1, 5-10 × 0.5-1.5 mm, linear-lanceolate, sparsely hairy. Flowers 18-30 in each umbellule, polygamous, with 5-16 mm long, unequal, hairy pedicels. Bracteoles 7-9, linear to subulate, unequal 1-5 mm long, sparsely hairy. Sepals obsolete or minute. Petals white, glabrous, outer petal strongly radiant; radiant petals ovate, c. 5 mm long, deeply bilobed, lobes ± incurved at apex; other petals ovate, c. 2 mm long, shallowly bilobed, incurved at apex. Ovary pubescent. Mericarp 9-12 × 6-9 mm, elliptic to obovate, strongly dorsally compressed, pubescent; Stylopodium short conical with ± undulate margin; styles 1.5-2 mm long, slender, deflexed; stigma capitate; Vittae subequal, the two inner slightly longer and attaining about 1/2-1/3 the length of the fruit on the dorsal surface, dorsal vittae 4, commissural vittae 2 or 1, vittae not reaching the ends of the fruit.

## CARPOLOGICAL CHARACTERS

The exocarp was covered with cuticle and consisted of a single row of epidermal cells. Different sized parenchymal cells made up the mesocarp. Three to four rows of sclerenchymatous cells made up the endocarp. Different sized parenchymal cells made up the margins. The wings stretched perpendicular to the fruit's axis and were made up of eight to ten rows of sclerenchymatous cells. Each mericarp had four dorsal vittae, which were made up of a single row of parenchymal cells. The same as dorsal vittae, 2 or 1 commissural vittae in fruit. There were three vascular bundles that connected the dorsal vittae. The fruit axis was parallel to the extension of the sclerenchymatous cells. The raphes are consisted of sclerenchymatous cells (Fig. 8).



FIG. 2. — *Heracleum kurdicum* Firat, sp. nov., holotype (*M. Firat 30271*): **A**, habit; **B**, basal leaf.



FIG. 3. — *Heracleum kurdicum* Firat, sp. nov.: **A**, cauline leaves and synflorescence; **B**, umbel in flower; **C**, umbel in immature fruit; **D**, umbel mature fruit; **E**, umbel ripe fruit.

## DISCUSSION

### TAXONOMIC RELATIONSHIPS

*Heracleum kurdicum* Firat, sp. nov. is morphologically different from all other *Heracleum* species. Its closest relative appears to be *Heracleum rawianum*, from which the

new species differs by many remarkable morphological differences (Table 1). *Heracleum kurdicum* Firat, sp. nov. is an endemic from Bala plateau (Hakkari/east Anatolia), high mountains of Iranian-Turanian geographic element, where it occurs in dry and slightly moist meadows at 2700–2800 m elevation. *H. rawianum* is a higher mountain





Fig. 4. — A, *Heracleum kurdicum* Firat, sp. nov., holotype (M. Firat 30271, VANF).



Fig. 5. — B, *Heracleum rawianum* C.C. Towns, holotype (K000685823) (in virtual herbarium of Royal Botanic Gardens Kew "K").

plant that grows at 3200-3300 m. In addition to being a higher mountain plant, it also likes stony rocky areas (Fig. 9B1), so the habitats of *H. rawianum* and the new

species do not match at all. In contrast to the pubescent fruit of *Heracleum kurdicum* Firat sp. nov., *H. rawianum* is glabrous. Although the number of vittae is equivalent,

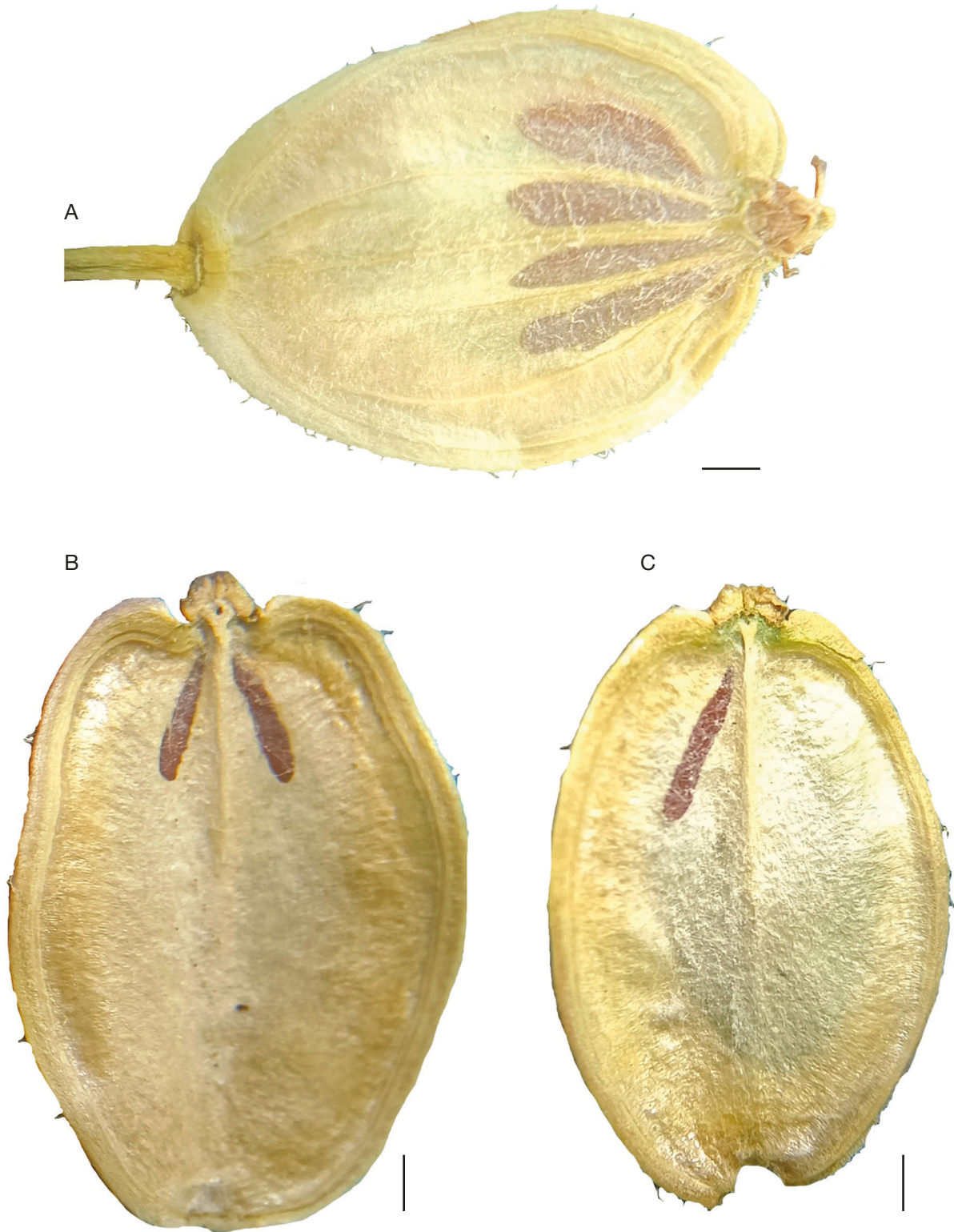


FIG. 6. — Mericarp of *Heracleum kurdicum* Firat, sp. nov. (*M. Firat* 30271): **A**, dorsal view (with subequal vittae  $1/2$ - $1/3$  length and pubescent); **B**, commissural view (with two vittae); **C**, commissural view (with one vitta). Scale bars: 1 mm.

the dorsal vittae in *H. rawianum* are more elongated than the inner two.

Since *Heracleum kurdicum* Firat, sp. nov. is directly distinguished from *Heracleum pastinacifolium* because of

commissural vittae, there is no need for discussion. When the description of *H. pastinacifolium* is analysed in virtual herbariums and written floras, commissural vittae are absent in all of them. Çil (2010) studied the fruit anatomy of many

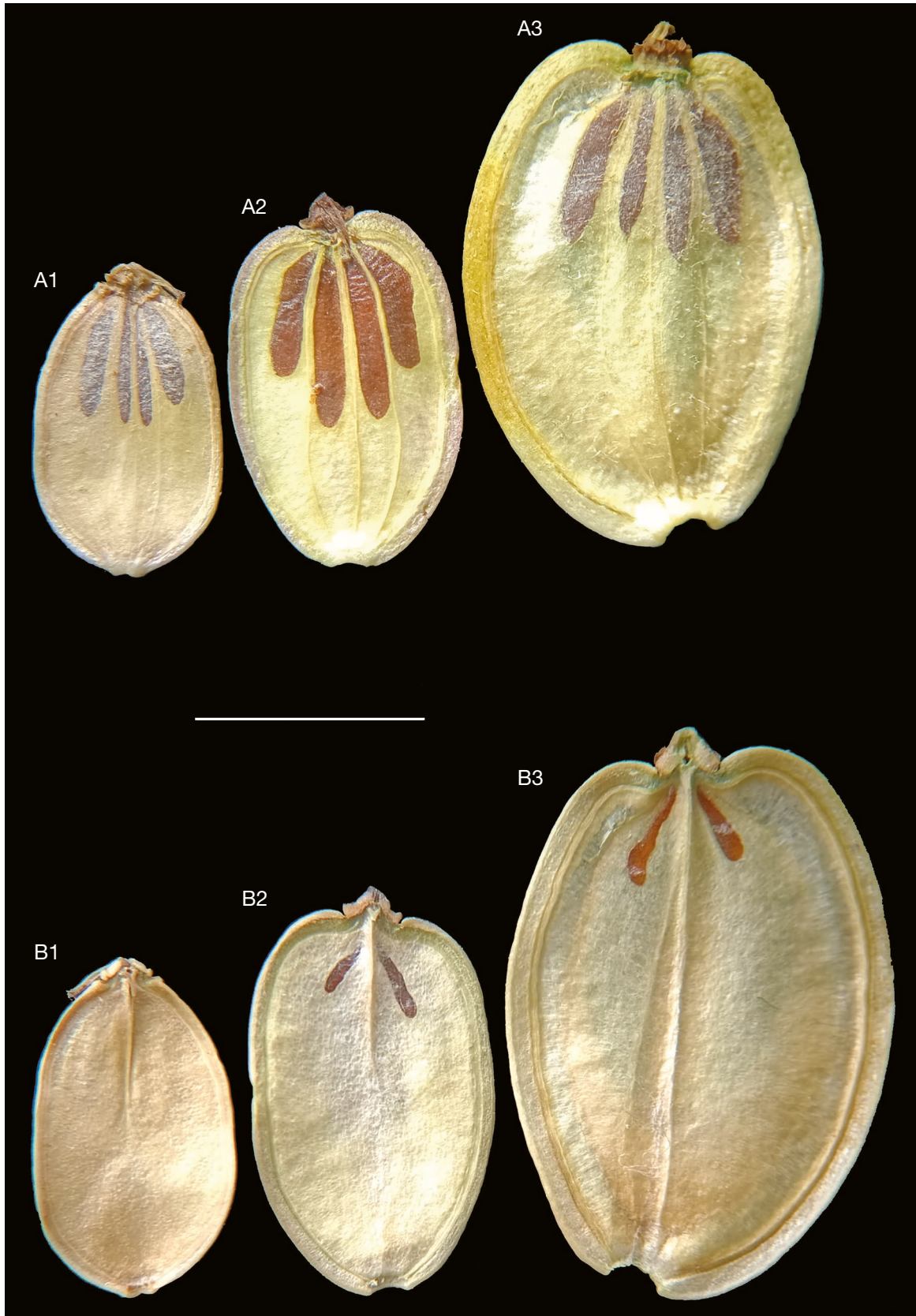


FIG. 7. — **A**, Dorsal view of mericarp: **A1**, *Heracleum pastinacifolium* subsp. *pastinacifolium* C.Koch (puberulent) (*M. Firat* 30794); **A2**, *Heracleum rawianum* C.C.Towns (glabrous) (*M. Firat* 30333); **A3**, *Heracleum kurdicum* Firat, sp. nov. (pubescent) (*M. Firat* 30271); **B**, commissural view of mericarp: **B1**, *Heracleum pastinacifolium* subsp. *pastinacifolium* (without any commissural vitta) (*M. Firat* 30794); **B2**, *Heracleum rawianum* (with two commissural vittae) (*M. Firat* 30333); **B3**, *Heracleum kurdicum* Firat, sp. nov. (with two commissural vitta) (*M. Firat* 30271). Scale bar: 5 mm.

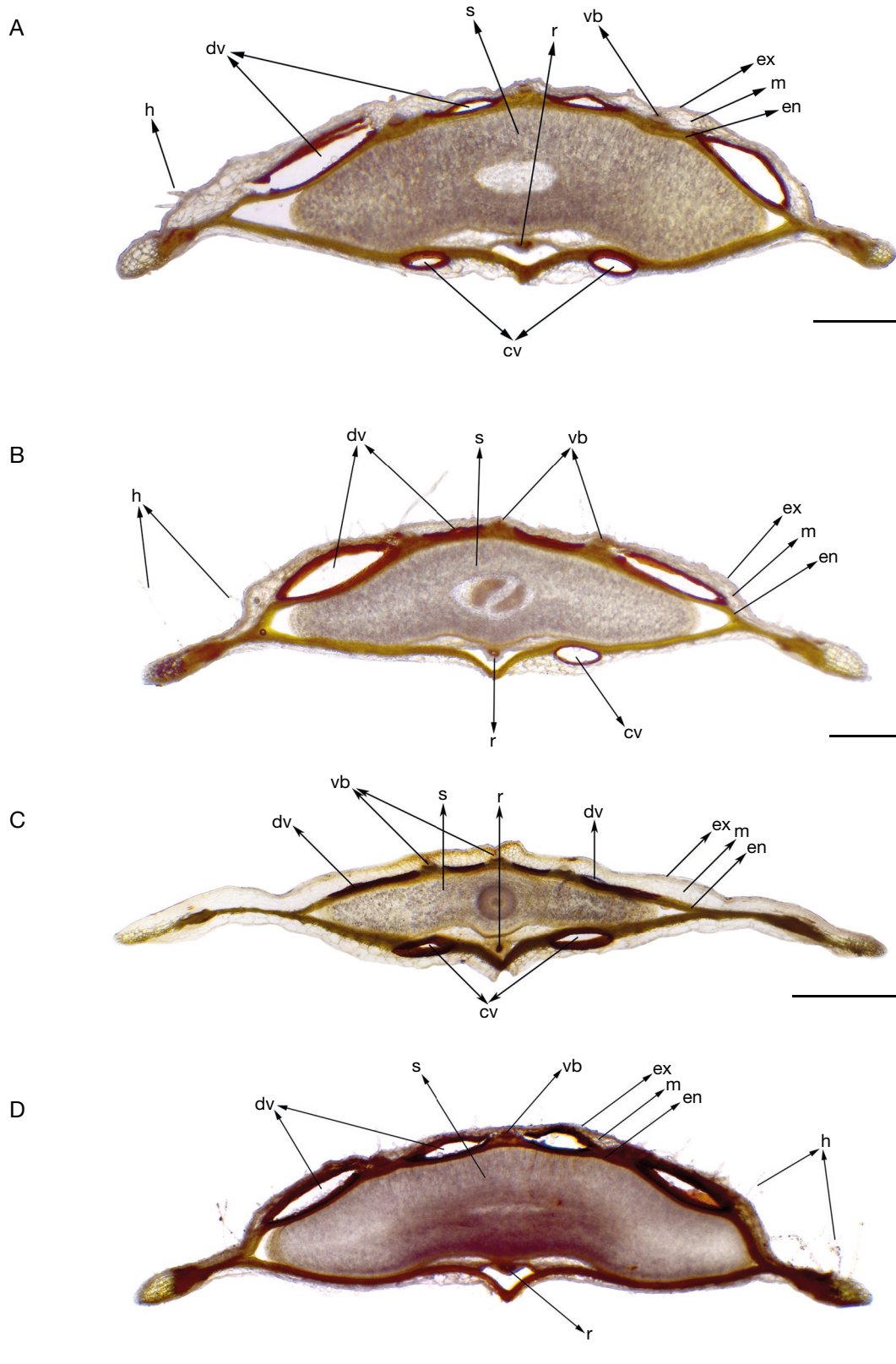


FIG. 8. — Cross sections of mericarp: **A**, *Heracleum kurdicum* Firat, sp. nov. (hairy, commissural vittae two) (*M. Firat* 30271); **B**, *Heracleum kurdicum* Firat, sp. nov. (hairy, commissural vitta one) (*M. Firat* 30271); **C**, *Heracleum rawianum* C.C.Towns (glabrous, commissural vittae two) (*M. Firat* 30333); **D**, *Heracleum pastinacifolium* subsp. *pastinacifolium* C.Koch (commissural without vittae) (*M. Firat* 30794). Abbreviations: **cv**, commissural vitta; **dv**, dorsal vitta; **en**, endocarp; **ex**, exocarp; **h**, hair; **m**, mesocarp; **r**, raphe; **s**, seed; **vb**, vascular bundle. Scale bars: 500 µm.

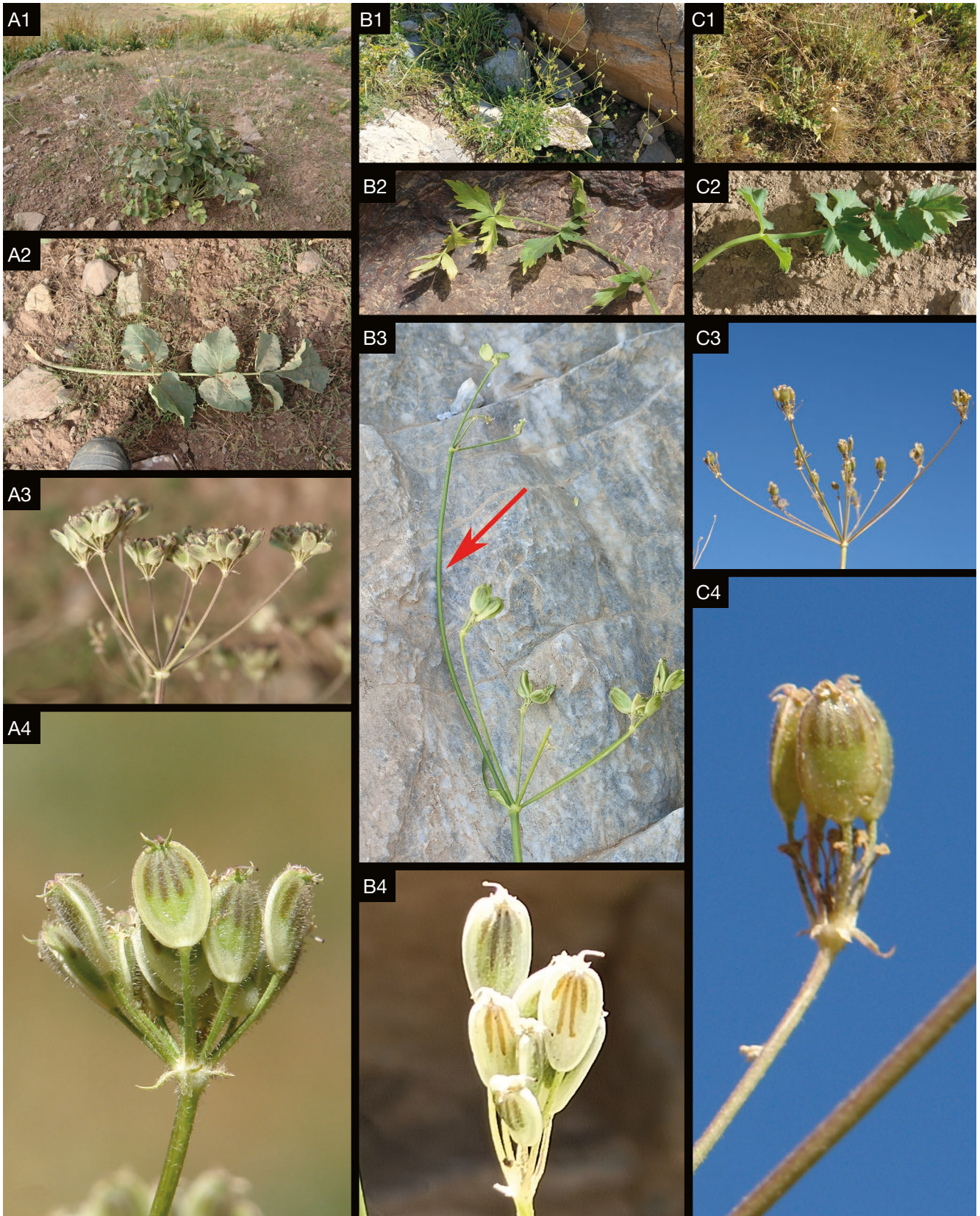


FIG. 9. — **A**, *Heracleum kurdicum* Firat, sp. nov. in fruit (M. Firat 30271): **A1**, habit; **A2**, basal leaf; **A3**, umbel; **A4**, umbellule; **B**, *Heracleum rawianum* C.C.Towns in fruit (M. Firat 30333): **B1**, habit; **B2**, basal leaf; **B3**, umbel with a lateral ray very long; **B4**, umbellule; **C**, *Heracleum pastinacifolium* subsp. *pastinacifolium* in fruit (M. Firat 30794): **C1**, habit; **C2**, basal leaf; **C3**, umbel; **C4**, umbellule.



FIG. 10. — **A**, Umbel of *Heracleum kurdicum* Firat, sp. nov. in ripe fruit (M. Firat 30271); **B**, umbel of *Heracleum rawianum* C.C.Towns in mature fruit (M. Firat 30333); **C**, umbel of *Heracleum pastinacifolium* subsp. *pastinacifolium* in ripe fruit (M. Firat 30794).

*Heracleum* species growing in Turkey in his master thesis. In this study, all three subspecies of *Heracleum pastinacifolium* (subsp. *pastinacifolium*, subsp. *transcaucasicum* (Manden.) Davis and subsp. *incanum* (Boiss. & A.Huet) Davis) were studied and there is no commissural vittae in all three.

*Heracleum kurdicum* Firat, sp. nov. is morphologically different from *Heracleum kurdistanicum* Rastegar, Maroofi & Tabad, by plant height 60-100 cm (6-35 cm), lower leaves oblong to elliptic (vs pinnately trifoliolate, rarely simple), leaflets petiolulate or sessile, terminal segments ovate to orbicular, 3-9 × 2-8 cm (vs suborbicular, sessile, 1.2-5 × 1-3.5 cm); leaves indumentum minutely hairy on both sides (vs both surfaces with dense acinaciform trichomes); rays number and length 7-14, 5-16 cm (vs 4-8, unequal, 2.5-10 cm); bracteoles 7-9, linear to subulate (vs 0-2, oblong-lanceolate); petals strongly radiant, radiant deeply bilobed (vs not radiant, shallowly 2-lobed); fruit 9-12 × 6-9 mm, elliptic to obovate, (vs 12 × 10 mm, obovate), dorsal vittae 4 (vs 3-4), commissural vittae 1-2 (vs 2). These two species are different in every respect.

*Heracleum kurdicum* Firat, sp. nov. differs directly from *Heracleum argaeum* Boiss. & Balansa morphologically and taxonomically by plant height, fruit size, the absence of commissural vittae in the fruit and the number of bracteoles. According to the key of the genus in the flora of Turkey, it is directly separated from *Heracleum argaeum* due to the absence of commissural vittae. *Heracleum kurdicum* Firat, sp. nov. is different from *Heracleum argaeum*; by plant height 60-100 cm (30-55 cm), lower leaves oblong to elliptic (vs ternate to pinnate); leaflets petiolulate or sessile, terminal segments ovate to orbicular, 3-9 × 2-8 cm (vs suborbicular to reniform, sessile, 3.5-6.5 × 2-5 cm); rays number and length 7-14, 5-16 cm (vs 7-11, unequal, 1.5-7 cm); bracteoles 7-9, linear to subulate (vs 0-2, ovate to lanceolate); petals strongly radiant, radiant deeply bilobed (vs somewhat radiant, shallowly 2-lobed); fruit 9-12 × 6-9 mm, elliptic to obovate (vs 7-8 × 5 mm, obovate to broadly elliptic); dorsal vittae 4 (vs 3-4); commissural vittae 1-2 (vs absent). Apart from these morphological differences, the geographical distribution between the two species is disconnected. Also in my personal opinion *Heracleum argaeum* is a variation of *Heracleum pastinacifolium*.

The genus *Heracleum* is known in Turkey with 18 species and 23 taxa (11 endemics). With the addition of *Heracleum kurdicum* Firat, sp. nov., the genus *Heracleum* is known in Turkey with 19 species and 24 taxa (12 endemics)

### Acknowledgements

I would like to thank Prof. Dr Ahmet Duran for his opinion that the specimen is different from the pictures and for answering some of my questions about the family Apiaceae. I would like to thank Murat Vural, geographer, for preparing the map in Figure 1. Dr Mohammad Aref Tabad (Kermanshah ACECR Institute of Higher Education) and three anonymous reviewers are also thanked for their help to improve the first version of the manuscript.

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Submitted on 4 March 2024;  
accepted on 8 July 2024;  
published on 19 December 2024.