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## Comparison between two *Eryngium* from Turkey: *E. heldreichii* and *E. davisii*

### Abstract

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*Eryngium heldreichii* Boiss. (= *E. bourgatii* subsp. *heldreichii* (Boiss.) Davis) is closely related to *E. davisii* Kit Tan & Yıldız. The main differences are in shorter stem height, prickly petiols, prickly margin of involucral leaves, linear-lanceolate bracts, oblong-obovate fruits without ridges, small vittae in mesocarp and crystals in endocarp.

### Introduction

*Eryngium* L. belongs to *Apiaceae* with about 250 species; it has a cosmopolitan distribution. It is the largest species of the *Apiaceae* and includes about four-fifths of the species of the subfamily *Saniculoideae* Burnett (Pimenov & Leonov 1993). 24 species (46% of the endemics) of *Eryngium* grow in Turkey (Davis 1972, Davis & al. 1988, Duman 2000, Wörz & Duman 2004).

*Eryngium* is easily distinguished from other members of *Apiaceae* by its capitate inflorescences and a single bracteole per flower. The genus, however, is extremely variable morphologically. Some plants are prostrate and only a few centimetres tall; others are erect and up to 3 m tall. Most species are herbaceous perennials, but many annual species also occur, and even a few are woody. Leaf morphology and venation are also variable. These plants may have long petiolated leaves or sessile ones, with entire to partite blades, entire, setose or spiny margins, and first order venation either pinnate, palmate or even parallel-veined. Involucral bracts at the base of the heads may be showy or indistinguishable from the other floral bracts. Fruits display scales and/or vesicles arranged dorsally. Wolff's (1913) grouped the species into 34 sections and numerous subsections. 12 sections from the Old World and the latter 22 sections from the Americas and Australia. Subsequent taxonomic studies of *Eryngium* have been restricted to plants from specific geographic areas, but have each used Wolff's system of classification. *E. heldreichii* and *E. davisii* belongs to Sect. *Campestris* Wolff.

*Eryngium* Sect. *Campestris* in Engler, Pflanzenr. IV.228 (Heft 61): 108, 140. 1913.

Perennials, basal leaves trifoliate with trisect to trifid segments, or segments irregularly pinnate or incised, or leaves more or less pinnate; segments mostly decurrent on rhachis.

Table 1 Diagnostic characters of *E. heldreichii* and *E. bourgatii*.

Character	<i>E. heldreichii</i>	<i>E. bourgatii</i>
Involucral bracts number and margin	7-12, not spinulose	10-15, spinulose
Sepals	ovate-lanceolate	lanceolate
Basal leaves margin	spinulose	not spinulose
Basal leaves petiole length	up to 20 cm	up to 15 cm
Fruit	oblong	obovoid
Distribution	Asia Minor, Syria	Iberian Peninsula, Morocco

Involucral leaves mostly with an additional whorl of spines at the base of the capitula. Fruits densely covered with long acuminate to filiform, white appendages, ovoid to conical.

### Material and Methods

Specimens were collected in the field in 2008-2009. The plant material were identified and deposited in the Herbarium of the Faculty of Pharmacy, Istanbul University (ISTE). For SEM observations dried mature mericarps were mounted on stubs using double-sided



Fig. 1. a. *Eryngium heldreichii* (ISTE 87498); b. *E. davisii* ISTE (87495)

Table 2 Diagnostic characters of *E. heldreichii* and *E. davisii*.

Character	<i>E. heldreichii</i>		<i>E. davisii</i>
<b>Stem</b>	30- tall, branched middle, glaucous		10- tall, branched above, greenish
<b>Basal leaves</b>	orbicular, 1-3 biternatisect, segments lanceolate, spinulose margined, 30-45 × 50-60 (-65) mm		± suborbicular, 1-3 palmatisect, 3-5 partite, segments tripartite or dentat, spinulose margined, 15-40 × 17- 50 (-60) mm
<b>Basal leaves petiole</b>	up to tall, not spinulose		(20-) 30- tall, spinulose or occasionally not spinulose
<b>Median cauline leaves</b>	orbicular, 1-3 biternatisect, segments lanceolate, spinulose margined, 30-45 × 50-60 (-65) mm		± suborbicular, 1-3 palmatisect, 3-5 partite, segments segments tripartite or dentat, spinulose margined, 10-45 × 10-
<b>Median cauline leaves petiole</b>	1- tall, not spinulose		10- tall, spinulose
<b>Capitulum</b>	5-18		1-7
<b>Bracteole</b>	linear, 7-		lanseolat-linear, 5-
<b>Fruit</b>	obovate		oblong-obovate
<b>Chromosome number</b>	2n=16		2n=14
<b>Mericaip (SEM) (Fig. 2)</b>	tuberculate - smooth		colliculate - verrucate
<b>Mericaip in transverse section (Fig. 3)</b>	<b>shape</b>	obovatus-depresse in transverse sections, dorsal ridges prominent, not winged, lateral ridges narrowly winged	obovatus-lattissime in transverse sections, ridges not prominent
	<b>surface</b>	tuberculate	colliculate
	<b>vallecular vittae</b>	few	numerous
	<b>crystals dispersed on endocarp</b>	absent	present
	<b>Seed</b>	flat on the commissural side	convex on the commissural side
<b>Peduncle in transverse section (Fig. 4)</b>	<b>collenchyma on cortex</b>	13-14 layered on hills, 9-10 layered on hollows	9-10 layered on hills, 6-7 layered on hollows
	<b>parenchyma on cortex</b>	7-8 layered on hills, 4-5 layered on hollows	13-14 layered on hills, 10-12 layered on hollows
	<b>secretory canal on cortex</b>	33-35	38-42
	<b>vascular bundles</b>	33-34	23
	<b>secretory canal on pith</b>	21-23	13-14

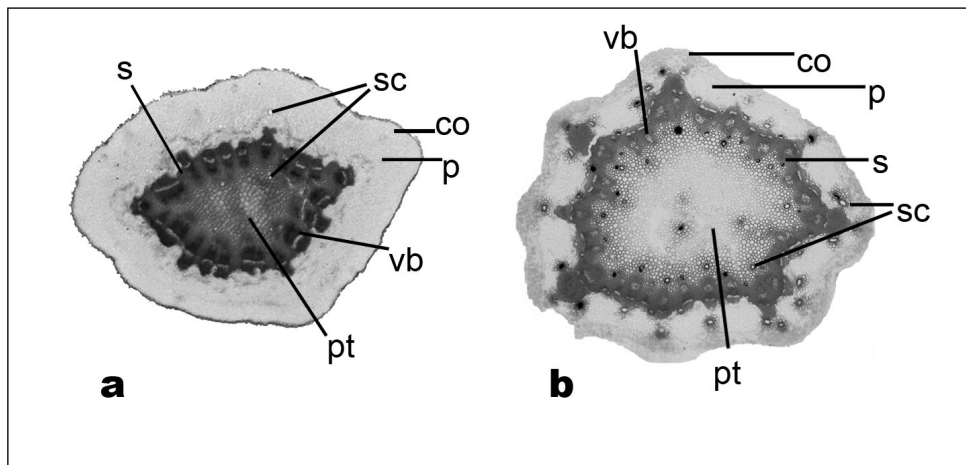


Fig. 2. Peduncule in trasverse section: a. *E. heldreichii*; b. *E. davisii* (co: collenchyma, p: parenchyma, pt: pith, s: sclerenchyma, vb: vascular bundles, sc: secretory canals).

adhesive tape. The specimens were examined with Jeol Neoscope JCM-5000 SEM. Terminology of seed-scale surface sculpturing basically follows Stearn (2005). Peduncule and mericarp transverse sections were cut at 7-10  $\mu\text{m}$  with a ice microtome. Slides were stained with a safranin (5%).

## Result and Discussion

*Eryngium heldreichii* is considered as a subspecies (*E. bourgatii* subsp. *heldreichii* (Boiss.) Davis) in Davis (1988). But, according to our surveys, it should be accepted at specific level as indicated in Boissier (1872) and Wörz (2004). The differential characters between *E. heldreichii* and *E. bourgatii* are given in Table 1.

*E. davisii* is an endemic species close to *E. heldreichii*, and originally included by its spiny winged petiols; spiny margined involucral bracts and oblong-obovate fruits (Fig. 1). The most important features of *E. heldreichii* and *E. davisii* are given in Fig. 2 and table 2.

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