

Anatomical, micromorphological and palynological studies on Turkish endemic *Heracleum platytaenium* Boiss. (Apiaceae)

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Abstract: *Heracleum platytaenium* is monocarpic and strongly aromatic plant and differs from other species with stout stem, obovate-suborbicular mericarp. Fruits are dorsally compressed. In this study, the anatomical features of the mericarp, as well as micromorphological characteristics of the pollen, fruit and leaf of pollen *H. platytaenium* have been investigated. A distribution map of this species is also given. Flattened mericarps are with filiforme dorsal ribs, and wings. Four vittae are found in the both, dorsal and commissural sides. The fruit surfaces are reticulate and striate structure. The leaves surface are reticulate and rugose structure. Mericarp surfaces are hairy. The hair shape of fruit and leaf are ribbon-type. The pollen grains are prolate in shape and tricolporate aperture. The exine sculpturing of this species is rugulate. The plants are used as a folk medicinal herb and food.

Key words: *Heracleum platytaenium*, anatomy, micromorphology, palynology

Introduction

The genus *Heracleum* L. of the family Apiaceae encompassed about 70 species in the world. It is represented in Turkey by 17 species, seven of which are endemic (Davis, 1972; Tkachenko, 1993). Some species of this genus have been used as antipyretic, analgaesic, diaphoretic (Taniguchi et al., 2005), antiseptic, carminative and digestive agents (Souri et al., 2004) and further for rheumatic disease, lumbago, gastralgia and injuries from falls, contusions and strains (Niu et al., 2004). They were also used in the treatment of hypertension (Eddouks et. al., 2002), epilepsy (Eadie, 2004; Sayyah et al., 2005) and diarrhoea (Baytop, 1999), as a food (Kültür 2008; Özdemir & Alpınar, 2010-2011; Kizilarıslan & Özhatay, 2012).

The compositions of the essential oil of *Heracleum platytaenium* Boiss. aerial parts, were determined. Twenty-two compounds (95.24 %) were determined (Akcin et al., 2013).

The objectives of this study are to give a detailed account of the anatomical, pollen, leaf and mericarp micromorphological characteristics, distribution and ethnobotanical uses of *H. platytaenium*.

Material and methods

Plant samples of *H. platytaenium* were collected from Eskişehir in Turkey. The collected plant samples were identified according to the Flora of Turkey and the East Aegean Islands (Davis, 1972). The collected material were kept as herbarium samples in Herbarium of the Faculty of Pharmacy, Istanbul University (ISTE 103 999).

For anatomical studies the plant material was stored in 70% alcohol solution. Anatomical sections of the material were taken from fruit by hand. All sections were examined in Sartur Reactive. Photographs were taken with a light microscope, Olympus BH-2 by using a microphotography apparatus. The anatomical descriptions were made by the terminology of Metcalfe and Chalk (1957).

For SEM analysis mature mericarps, leaves and pollen grains were prepared. The samples were mounted on stubs and coated with gold, after they were studied with a FEI Quanta 450 FEG-EDS scanning electron microscope. For descriptions micromorphological features of pollens and fruits was used the terminology of Stearn (2005).

Results and discussion

Morphological description

It is strongly aromatic, perennial herbaceous and monocarpic species. The plant is a tall (1-2 m) with a thick stem and rootstock. The basal leaves are ternate, trisect or only pinnately lobed, lamina more than 25 cm long, glabrous to scabrid above, grey-tomentose below, the leaflets or primary divisions shortly lobed, the lobes broadly ovate or rounded, crenate-dentate. Upper cauline leaves with very broad, inflated, truncate to retuse, dentate sheaths. Rays 25-80, unequal, 3-18 cm, scabrid to hirsute.

Bracteols linear lanceolate. Flowers are white. The fruits are dorsally compressed. The fruit shape is cordate and cordate to obovate, 8-14 x 6-11 mm. The mericarp apex is emarginate (Figure 1) (Davis, 1972).

Flowering time: May to August

Habitat and ecology: Mixed forest, stream sides, rocky slopes, banks. It is usually occurs in the forest clearings- especially in *Fagus orientalis* forest.



Figure 1: Habitat of *H. platytaenium*

Altitude: *s.l.*-1500 m.

Distribution: (Endemic) Zonguldak, Bursa, Eskişehir, Balıkesir, Amasya, Giresun, Trabzon, Rize, İzmir, Kastamonu, Manisa, Kütahya, Ankara, Konya (Figure 2).

Examined specimen: Turkey, Eskişehir, Eskişehir-Bursa road, roadside, G. Ecevit-Genç & İlker Genç, 21.05.2014 (ISTE 103 999).



Figure 2: Distribution map of *H. platytaenium* in Turkey

Anatomical properties

The *H. platytaenium* fruits are dorsally compressed. Flattened mericarps are with filiform dorsal ribs, and wings. Four vittae are found in the both, dorsal and commissural sides. (Figure 3).

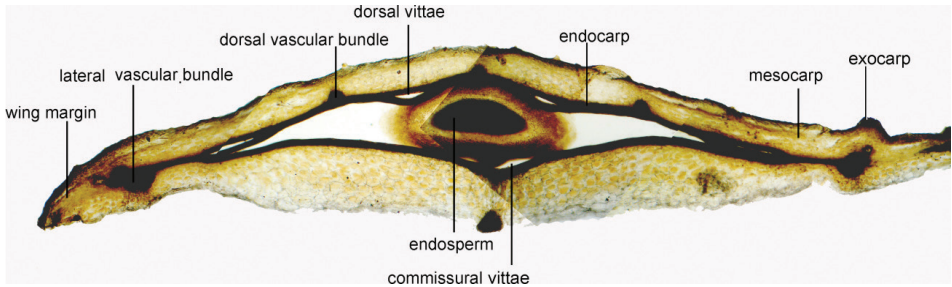


Figure 3: Cross section of the mericarp of *H. platytaenium*

Micromorphological properties

Fruit: The SEM study shows that all cells on the dorsal surface are pentagonal or hexagonal and form a reticulate and striate structure. Mericarp surfaces are hairy. The hair shape is ribbon-type (Figure 4).

Leaves: Leaf micromorphology is the similar to fruit. The cell shape is pentagonal or hexagonal and form a reticulate and rugose structure. Leaf

surface have ribbon type hairs. The lower surface of the leaf is more hairy than the upper surface (Figure 4).

Palynological properties

Pollen grains of the studied species of *H. platytaenium* are prolate in shape and tricolporate aperture. The exine sculpturing of this species is rugulate (Figure 4).

Ethnobotanical uses

H. platytaenium known as vernacular names havlan, halvanotu, hometi, kekrer, ayı kulağı, romati, yabanlahanası in folk medicine of Turkey. It is also used against to sunstroke, epilepsy, gastritis, enteritis, headache and stems and leaves also used as a food and animal fodder (Yıldırım et al., 2008; Cansaran et al., 2010; Özdemir & Alpınar, 2010; Kızıllarslan & Özhatay, 2012; Sargın et al. 2013).

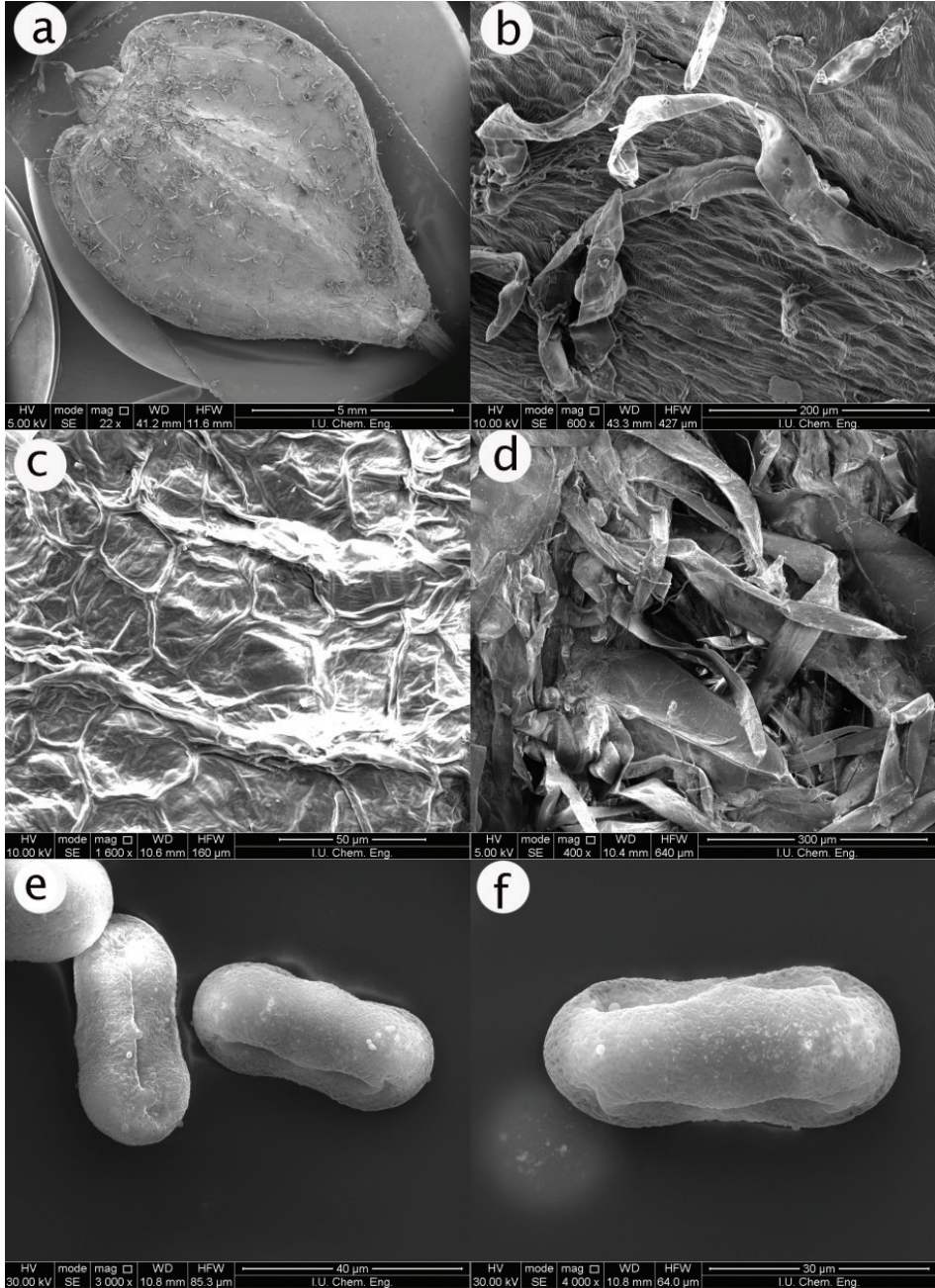


Figure 4: SEM micrographs; a-b fruit surface, c-d leaf surface, e-f pollen grains

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