

Anatomical and micromorphological studies on an unknown vegetable in Turkey, *Smyrniium olusatrum* L. (Apiaceae)

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Abstract: *Smyrniium olusatrum* L. is a biennial, stout plant which is growing naturally in North, West and South Turkey. It is used as food only in some localities of Turkey. In this study, fruits of *S. olusatrum* were examined with a SEM (Scanning Electron Microscopy) for micromorphological research. Also transverse sections of fruit, peduncle and leaf were examined for anatomical studies. The aim of this study is to identify it clearly on the basis of anatomy and micromorphology.

Key words: *Smyrniium olusatrum*, anatomy, micromorphology, Apiaceae, Turkey

Introduction

Smyrniium olusatrum L. is a biennial, stout plant which is growing to a height of almost 150 cm (Figure 1). It is naturally grown around hedgerows, roadsides, waste places and sea cliffs, from sea level to 300 metres in North, West and South Turkey. Its flowering time is from March to May (Davis, 1972).

“*Smyrniium*” means “myrrh”, because of the fruits having a myrrh-like oil and “*olusatrum*” means “black herb” because of its ripe black fruits (Maggi et al., 2012). It is known as “Baldıran, Yabani kereviz, Deli kereviz, Göret and Kokar baldıran” in Turkey (Bulut & Tuzlacı, 2013; Dogan, 2012; Ertuğ, 2004; Tuzlacı, 2011). It is known in Italian as “Macerone, Corinoli and Sedano selvatico”, in English as “Alexanders and Wild celery” and in French as “Maceron” (Maggi et al., 2012). Of

all the Umbelliferae used as vegetables, *S. olusatrum* has been one of the commonest in gardens for many centuries. It was formerly cultivated all over Europe as an edible vegetable until the Middle Ages, when it has been replaced by celery (*Apium graveolens* L.) in the modern diet. Today, no cultivated form of *S. olusatrum* exists (Bertoli et al., 2004; Hernandez Bermejo, 1994; Molleken et al., 1998; Zohra & Fawzia, 2011).

Although the whole plant can be eaten (leaves, young stems, flower buds and roots as herb, ripe fruits as seasoning) (Crawford & Aitken, 2013; Maggi et al., 2012) and has a wide distribution area in Turkey, there are few records demonstrating its consumption as a vegetable. Its aerial parts and leaves are used as food, leaf stalks are eaten raw and added to pickle only in some localities of Turkey (Dogan, 2012; Dogan et al., 2013; Ertuğ, 2004), also plant used as an ornamental (Başer, 1997).

Materials and methods

In this study, fruits of *S. olusatrum* were examined with a SEM (Scanning Electron Microscopy) for micromorphological research. Also transverse sections of fruit, peduncle and leaf were examined for anatomical studies.

The plant material was collected from Florya/Istanbul on April 2013. Collected specimens were identified and prepared voucher specimens were kept in the Herbarium of Istanbul University Faculty of Pharmacy (ISTE).

The dried parts (fruit, peduncle, leaf) were waited in warmish water for anatomical studies and then all transverse sections were cut by hand with blade. Samples were investigated in Sartur reagent. Photographs were taken with Olympus BH-2 microscope.

The dried ripe fruits were mounted on clean stubs by using double-sided adhesive tape for SEM study. Then stubs were coated with gold in a vacuum coating unit and examined with a Scanning Electron Microscope, FEI - Quanta FEG 250 SEM. Features of exocarp surface patterns were described following the terminology by Stearn (Stearn, 1992).



Figure 1. a) General appearance, b) Fruits of *S. olusatrum*

Results and Discussion

S. olusatrum has glabrous and ridged stem; 2-4-ternate or pinnate basal leaves and 1-ternate or ternatisect upper stem leaves. Umbels 7-17(-30) rayed, bracts and bracteoles usually absent. Flowers hermaphrodite; sepals obsolete, petals oblong-obovate, yellow. Fruit \pm ovoid, 5-7 x 2-4 mm.

According to our micromorphological research, *S. olusatrum* has subdidymous mericarps with Favuloriate – Rugose exocarp surface (Figure 2).

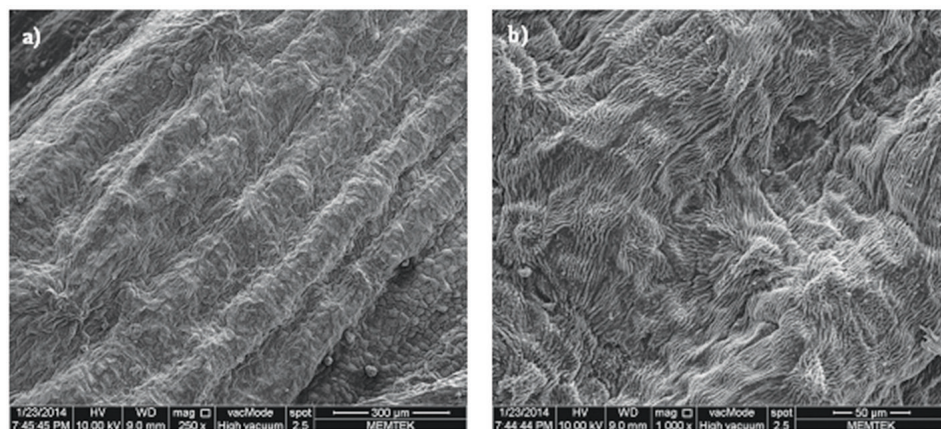


Figure 2. Pericarp surface of *S. olusatrum* a) 250x, b) 1000x magnification

According to our anatomical researches, *S. olusatrum* has dorsiventral leaves and multivittate fruits. If we explain in detail;

Fruit (Figure 3)

General appearance: Mericarps are two, homomorphic, black when ripe. 3 dorsal ribs prominent.

Pericarp:

Exocarp: Cuticula is thick with tubercules. Epidermis consists of single line, oblong cells.

Mezocarp: Mezocarp consists of irregular-sized, rotund-polygonal parenchymatic cells. 2 layered collenchymatic tissue is present below the exocarp of 3 dorsal ribs. 1 rib oil duct is present towards each head of the ribs, above vascular bundles and 2 vittae are present in commissural area, above vascular bundles. Vascular bundles 5, clearly seen in each ribs and commissural surface of mericarp. Starch grains are condensed in commissural area and around vascular bundles. 35-36 circularly arranged vittae are present above endocarp. Vittae ovoid, different in size.

Endocarp: Endocarp consists of single-layered cells.

Seed: Druse crystals are absent in endosperm. The endosperm is concave and the hollow resembles a mushroom.

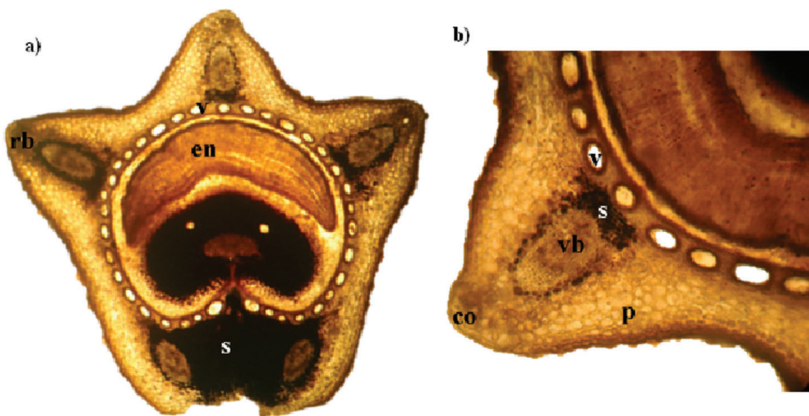


Figure 3. a) Transverse section of *S. olusatrum* fruit, b) Dorsal rib of fruit (co- Collenchyma, en- Endosperm, p- Parenchyma, rd- Rib oil duct, s- Starch, v- Vittae, vb- Vascular bundles)

Leaf (Figure 4)

Epidermis: Cuticula is thin. Both upper and lower epidermis are composed of a single-layered flat-rectangular cells.

Mesophyll: Leaves are dorsiventral. Palisade parenchyma cells cylindrical and single-layered. Spongy parenchyma cells circular, ovoid or rarely irregular shaped and 5-6 layered. Vittae can be seen irregularly in mesophyll.

Midrib: Midrib bundle is collateral type. The collenchymatic tissue is located above and below the bundle, near epidermis. There are 2 vittae, one below the phloem, one above the xylem.

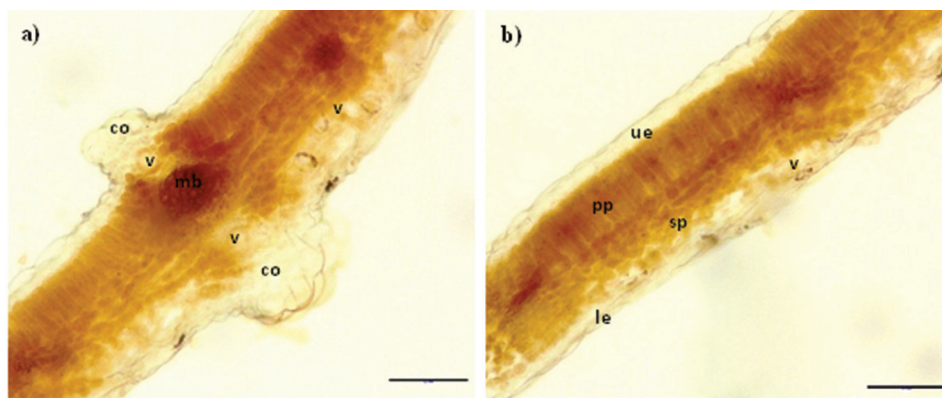


Figure 4. Transverse sections of *S. olusatrum* leaf **a)** Midrib, **b)** Lamina (le- Lower epidermis, mb- Midrib bundle, pp- Palisade parenchyma, sp- Spongy parenchyma, ue- Upper epidermis)

Peduncle (Figure 5)

General appearance: Such an irregular pentagonal shaped. 5 edges can be seen.

Epidermis: Cuticula is thick, undulate, rarely papillose. Epidermis is composed of a single-layered, thick-walled, square-rotund, sometimes polygonal cells.

Cortex: Adjacent to the epidermis the cortex starts with 8-9 layers of collenchyma. The remainder of cortex is composed of thin-walled

parenchyma cells in different sizes. Parenchyma contains plenty of starch granules. 16-19 vittae are distributed in mesocarp.

Vascular cylinder: A thick sclerenchymatic tissue (10-16 layered) with vascular bundles surrounds the entire vascular cylinder. 3-6 layered sclerenchyma cells are present above and below the vascular bundles as supporting tissue. Pith is composed of large parenchyma cells.

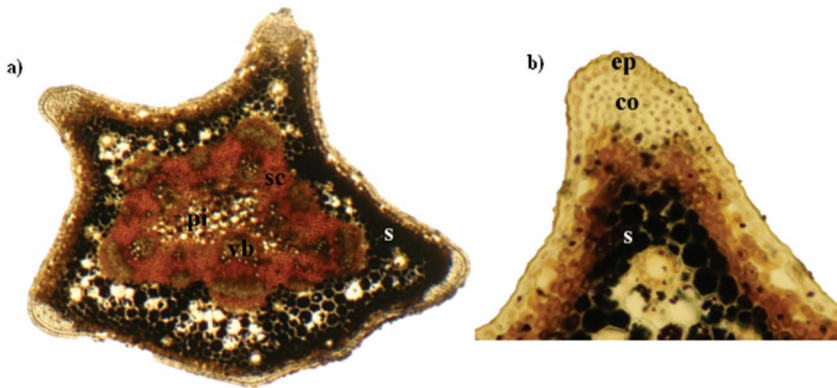


Figure 5. a) Transverse section of *S. olusatrum* peduncle, b) Edge of peduncle (ep- Epidermis, pi- Pith, sc- Sclerenchyma)

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