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Fruit anatomy of some Apiaceae plant species from Niğde-Aladağlar/ Turkey

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Abstract: Anatomical characters are very important to distinguish between closely related species and genera, especially in the family Apiaceae. Anatomy of Apiaceae fruits varies strongly, even among closely related species in the same genus. An ethnobotanical study was conducted between 2004 and 2005 in order to determine wild used plants in West part of Niğde-Aladağlar. According the data of this study's, 3 plant species belong to Apiaceae family sold to different tea companies by local people. Anatomical characteristics of fruits of the *Ferulago pachyloba, Prangos ferulacea, Prangos meliocarpoides* have been studied. *Ferulago pachyloba* has winged dorsal ribs, equal to or shorter than seeds. *Prangos ferulacea* has five blocks of mesocarp, they are not separated by the exocarp and the vascular bundles usually surround each block. *Prangos meliocarpoides* has continuous mesocarp and not separated into blocks. Druse crystals do not exist in the endosperm of *F. pachyloba*, *P. ferulacea*, and *P. meliocarpoides*.

Key words: *Ferulago pachyloba, Prangos ferulacea, P. meliocarpoides*, Aladağlar, Niğde, fruit anatomy, Turkey

Introduction

Anatomical characters are very important to distinguish between closely related species and genera, especially in the family Apiaceae (Akalın & Kızılarslan 2013). Anatomy of Apiaceae fruits varies strongly, even among closely related species in the same genus (Metcalfe & Chalk 1979) (Duran et al., 2005). Forty-nine *Ferulago* species are distributed in Europe (except northern Europe), south western and Central Asia, Caucasia, northern and north-western Africa. Thirthy-four species are known in Turkey (Akalın

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& Kızılarslan 2013). The genus *Prangos* (Apiaceae) is represented by 30 species with a diversity centre in the Irano-Turanian phytogeographic region (Şenol et al 2011). In the Flora of Turkey, Herrnstadt and Heyn recognized 10 species of *Prangos* (Davis, 1972).

Since the publication of the Flora of Turkey, four more species of *Prangos* were described from Turkey, making the total species number 14 (Davis et al., 1988; Duman & Watson, 1999; Duman, 2000; Duran et al., 2005, Pehlivan et al., 2009; Özhatay et al., 2013).

Material and methods

An ethnobotanical study was conducted between 2004 and 2005 in order to determine wild used plants in West part of Niğde-Aladağlar (Özdemir & Alpınar 2005). Collected plant specimens and some parts of plant samples are kept in ISTE (The Herbarium of the Faculty of Pharmacy in Istanbul University). According the data of this study's, some plant specimens sold to different tea companies by local people. Among these plants, three plant species belong to Apiaceae family: *Ferulago pachyloba* (Fenzl) Boiss. - (ISTE 81544), *Prangos ferulacea* (L.) Lindl. - (ISTE 81491) , *Prangos meliocarpoides* Boiss. var. *meliocarpoides* - (ISTE 81576). Fruit mericarps were waited in warmish water and then all transverse sections were cut by hand from the middle of the mericarps with a blade. Samples were investigated in Sartur reagent. Photographs were taken with an Olympus BH-2 microscope.

Results and discussion

Ethnobotanical features of three commercial plant species belong to Apiaceae family in Aladağlar/ Niğde:

Figure 1: Celaller Village in Aladaglar, Tea house- interview

Figure 2: Geographical location of the study area

According the data of ethnobotanical study in West part of Niğde-Aladağlar (Özdemir & Alpınar 2005) some plant specimens sold to different tea companies by local people. Ethnobotanical features of three commercial plant species has been given below.

Table 1. Ethnobotanical features of three commercial plant species belong to Apiaceae family in Aladağlar/ Niğde

Botanical name, Family, Voucher number	**Local names in Niğde/ Aladağlar**	**Used parts**	**Preparation**	**Therapeutic effect**	**Administration, dosage**
Ferulago pachyloba (Fenzl) Boiss. (Apiaceae) ISTE 81544	Küçük Melek Otu	Leaf, fruit	• Infusion	Increase body strength, increase sleep quality, relaxating	• O. Ad drink one teacup two times a day for a week.
Prangos ferulaceae (L.) Lindl. (Apiaceae) ISTE 81491	Çağşır, köfteotu, kürdanotu, melekotu, pıtrak	Root, fruit	• Grate and mixed with sweets	Aphrodisiac, increase body strength	• O.Ad. eaten
Prangos meliocarpoides Boiss. var. *meliocarpoides* (Apiaceae) ISTE 81576	Çarşır, Hiltil, Sultan Teresi,Yabani Korunga	Root, fruit, leaf	• Grate and mixed with sweets and honey	Aphrodisiac	• O.Ad. eaten

1. Morphological characteristics of fruits of *Ferulago pachyloba* (Fenzl) Boiss.

Figure 3: *Ferulago pachyloba*

Figure 4: Fruit of *Ferulago pachyloba*

Mericarps elliptic, c. 8 x 5 mm, truncate at the base (Figure 4). Dorsal ridges narrowly winged, lateral wings c. 1 mm wide; dorsal vittae 12-14, commissural 6-8. (Davis, 1972)

Flowering time: 7-8.

Habitat and altitude: Rocky places, 1500-2600 m (Figure 3).

Distribution in Turkey: İçel, Niğde. Endemic.

Phytogeographical region: Iranian-Turanian element

Examined specimen: Niğde, Dündarlı, 24.4.2004, E.Özd., ISTE 81544

Local names in Aladağlar / Niğde: Küçük Melek Otu

Fruit Anatomy of *Ferulago pachyloba*:

Ferulago pachyloba has winged dorsal ribs, dorsal ribs equal to or shorter than seeds. Druse crystals do not exist in the endosperm (Figure 5).

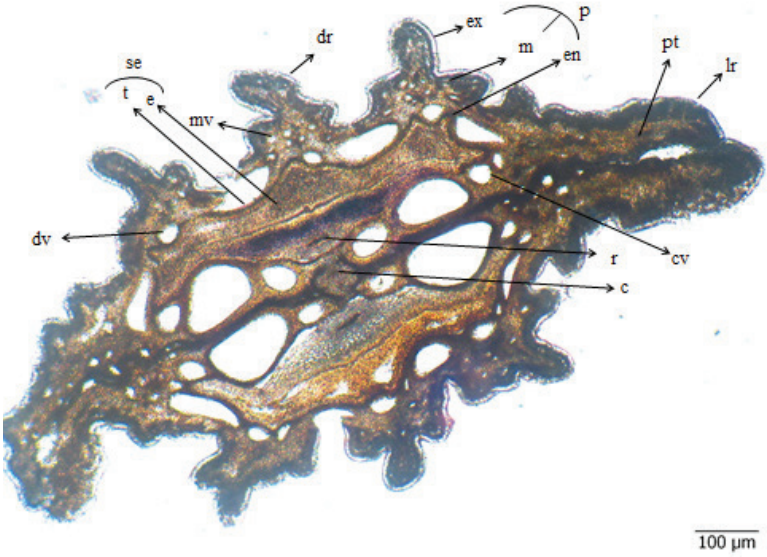

Figure 5: Cross section of schizocarp; c: carpophore; cv: commissural vittae; dr: dorsal rib; dv: dorsal vittae; en: endocarp; e: endosperm; ex: exocarp; lr: lateral rib; m: mesocarp; mv: vittae distributed in mesocarp; p: pericarp; pt: parenchymatic tissue; r: raphe; se: seed; t: testa.

2. Morphological characteristics of fruits of *Prangos ferulacea* (L.) Lindl.

Figure 6: *Prangos ferulacea*

Figure 7: Fruit of *Prangos ferulacea*

Fruit with a variable amount of corky mesocarp, ellipsoid to globose, 12-25x10-15 mm (Figure 7). Wings absent or up to 3 mm wide, when present straight to slightly undulate, sometimes with erose margins; stylopodium, comparatively small, somewhat embedded in the pericarp. (Davis, 1972)

Flowering time: 5-7

Habitat and altitude: Among rocks, 600-2500 m (Figure 6).

Distribution in Turkey: Inner and adjacent N. & S. Anatolia. Kastamonu, Giresun, Gümüşhane, Bayburt, Kars, Erzurum, Ağrı, Konya, Maraş, Hakkari.

General distribution: Balkans, Italy, Sicily, Cyrenaica, W. Syria, Caucasia, Iran.

Phytogeographical region: Iranian-Turanian element

Examined specimen: Niğde, Çamardı, 2200m., 21.6.2004, E.Özd., ISTE 81491

Local names in Aladağlar / Niğde: Çağşır, Köfte otu, Kürdan otu, Melekotu, Pıtrak

Fruit Anatomy of *Prangos ferulacea*:

The fruits of *Prangos* are, as a rule, conspicuously large and have a

thick layer of mesocarp. (Duran et al., 2005) *Prangos ferulacea* has five blocks of mesocarp, they are not separated by the exocarp and vascular bundles usually surround each block. Druse crystals do not exist in the endosperm of *P. ferulacea* (Figure 8).

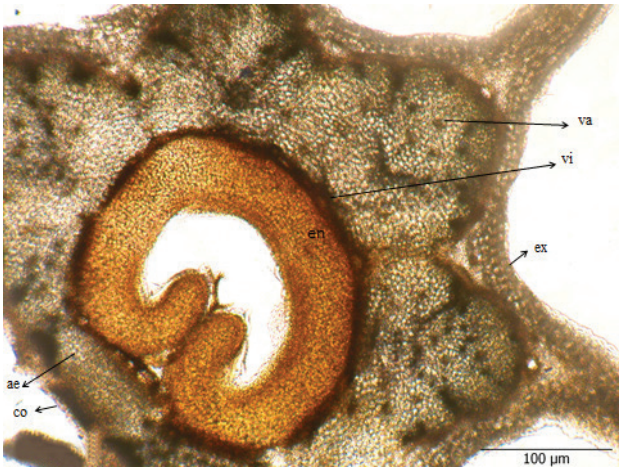

Figure 8: Cross section of mericarp: ae: aerenchyma; en: endospem; vi: ring of vittae; co: commissure; va: vascular bundle; ex: exocarp

3. Morphological characteristics of fruits of *Prangos meliocarpoides* Boiss.

Figure 9: *Prangos meliocarpoides*

Figure 10: Fruit of *Prangos meliocarpoides*

Fruit pyriform, 12-17x6-8 mm; wings 2-4 mm (Figure 10). Fruit is wide

above, decreasing in with towards the base, straight to slightly undulate with an entire or crenate margin; mesocarp continuous with vascular bundles evenly scattered in a layer parallel to the seed in the outer part of the mesocarp (Davis, 1972).

Flowering time: 5-7(-8).

Habitat and altitude: Rocky slopes, etc., 850-2000 m.

Distribution in Turkey: Mainly Inner and adjacent S. Anatolia. Amasya, Kütahya, Konya, Ankara, Kayseri, Maraş, Malatya/Adiyaman, Burdur, Konya, Niğde, Adana, Urfa. Endemic. Phytogeographical region: Iranian-Turanian element.

Examined specimen: Niğde, Çamardı, Demirkazık village hills. 1700m., 23.4.2004, E.Özd., ISTE 81576

Local names in Aladağlar / Niğde: Çarşır, Hiltil, Sultanteresi, Yabani korunga

Fruit Anatomy of *Prangos meliocarpoides*:

Prangos meliocarpoides has continuous mesocarp and not separated into blocks, Druse crystals do not exist in the endosperm of *P. meliocarpoides* var. *meliocarpoides* (Figure 11).

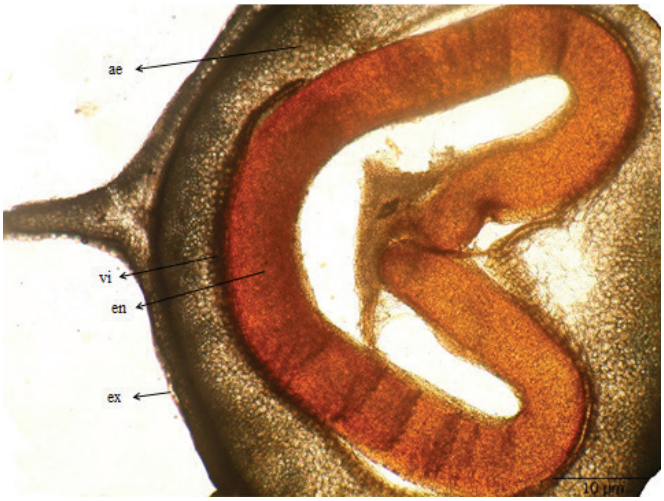

Figure 11: Cross section of mericarp: ae: aerenchyma; en: endospem; vi: ring of vittae; ex: exocarp

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