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ANATOMICAL AND PALYNOLOGICAL INVESTIGATIONS ON ENDEMIC *ONOSMA MERSINANA* RIEDL, BINZET & ORCAN

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Abstract

This study determines the anatomical and palynological characteristics of the endemic *Onosma mersinana* Riedl, Binzet & Orcan (Boraginaceae). The examined species is perennial and collected from Mersin vil. The root of examined species observed as secondary structure. Stem pith consist of paranchymal cells. Some pith cells contain crystals. In transverse sections, the leaves are isolateral (=equifacial) in type. The pollen type is syncolporatae. Pollen shape is prolatae P/E: 1.39 (W); subprolatae P/E: 1.22 (E).

Introduction

The Boraginaceae are distributed throughout the tropical, subtropical, and temparate regions of the world. The centers of highest diversity in the North Temperate Zone are the Irano-Turanian and Mediterranean regions and in the tropics are Central America and nothern and central south America (Al-Shehbaz, 1991). In Turkey, the genus *Onosma* has 102 taxa (97 species, 4 varieties, 1 hybrid species and 50 endemic species, 1 endemic variety) and the rate of endemism according to native species is 50% (Yıldırımlı 2000, Riedl *et al*., 2005, Binzet and Orcan 2007). Since the genus was revised for the *Flora of Turkey* (Riedl, 1978), some new species have been described and several new records made. These include *O. propontica* Aznav., *O. kaheirei* Teppner, *O. taurica* Palas ex Willd. var. *viridis* Borbas, *O. mirabilis* A.P. Khokhr, *O. nydeggeri* Hub.-Mor., *O. mersinana* Riedl, Binzet & Orcan and *O. riedliana* Binzet & Orcan. The rough surface of members of the *Boraginaceae* is generally caused by unicellular, but occasionaly 2- or more celled, conical, calcified and silicified bristles sometimes described as boraginaceous hairs. Glandular hairs with short or long stalks and variously shaped, unicellular deads recorded in species of *Alkana* Tausch., *Anchusa* L., *Borago* L., *Cordia* L., *Echium* L., *Heliotropium* L., *Lithospermum* L., *Lycopsis* L., *Nonea* Medicus., *Onosma* L., *Pulmunaria* L., *Symphytum* L. Cork arising superficially in species of *Cordia* L., *Ehretia* Lehm., *Moltkia* Lehm., and *Onosma* L. Secretory cells are found in the pith only in species of *Mertensia* Roth., and *Onosma* L., (Metcalfe & Chalk,1950). Palynological properties of some *Onosma* species from Pakistan was studied by Qureshi & Qaiser (1987), Anatomical and palynological characteristics of some *Onosma* species was examined by Binzet & Orcan (2003) and the anatomical characteristics of some *Onosma* species was examined by Akçin & Engin (2001). The present report gives an account of anatomical and palynological characteristic of the endemic plant *Onosma mersinana* Riedl, Binzet & Orcan.

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Materials and Methods

The examined specimens were collected from C5: Mersin, Erdemli, Müğlü deresi, 36^0 49´´ N, 34^0 16´´ E, 1100 m, stony slopes, 04.05.2004, coll. R. Binzet, Her. No: Binzet 17. The specimens are deposited in the herbarium of Biology Department, Mersin Üniversity, Turkey.

For anatomical studies, the root, stem and leaves of the specimens were soaked in 70% alcohol and sartur dye was used for tissue distinguishing. The pollen grains were obtained from the fresh and herbarium materials. The pollen slides were prepared according to the method of Wodehouse (1965) and Erdtman (1952). Measurements and microphotographs of the pollen grains were made one month later, after the normal dimension and forms were restored. The polar axis, equatorial diameter and other parameter (exine, intine, plg, plt, clg, clt, t) of the pollen grains were measured by Olympus BX40 with a x100 objective until the Guassian curve was obtained. The results were calculated by the following formulae:

$$M = m + a \,.\, 1 / n \,.\, \sum x\, y$$
$$\sigma = \pm a \,.\, \sqrt{1 / \; n \sum x^2\, y - u^2}$$

Anatomical Results

Root: A secondary structure is observed. Outermost, cork tissue is composed of 15-25 layers. Parenchymal cortex with 15-20 layers is found under the cork tissue. Cambium with 2-3 layers is located between phloem and xylem. The pith consist of xylem elements covering a wide area. Sclerenchyma groups are observed as separate in xylem.

Stem: Outer most, one-layered epidermis is observed along with thickened walls. Setose, stellate, glandular hairs and stomata occur above the epidermis level. A parenchymal cortex with 10-12 layers is found under the epidermis. Endodermis under the cortex as indefinite 1-2 layers. Cambium of 2-3 layers lies between phloem and xylem. Xylem tissue is composed of many obscure vascular bundles. The pith consist of parenchymal cells covering a wide area.

Leaves: In transverse section**s,** the leaves are isolateral (=equifacial) in type. Outermost, the epidermis has a thin membrane with one-layered cells. Setose, stellate, glandular hairs and stomata are found on the epidermis. Stomatas are observed on both surfaces (=amfistomatic). While stomatas occur on the same level with the upper epidermis, stomatas are found on above the lower epidermis level. Stomatas are surrounded by 3-4 cells (=anizositic) on the ventral and dorsal side and measure 25.30 x 7.90 μm on the dorsal side 25.72 x 8.01 μm on the ventral surface. Stomata on the dorsal side outnumber those on the ventral side.

Palisade parenchyma has two-layered cells on the upper and one-layered cell on the lower surface. Spongy parenchyma with 2-3 layered cells lies between the upper and lower palisade. The main vessel is more developed. Vascular tissue is surrounded by one-layered parenchymal bundle sheath. Collenchyma with 2-3 layered take place under the lower epidermis and it found with 2-4 layered lower and upper of vascular bundles.

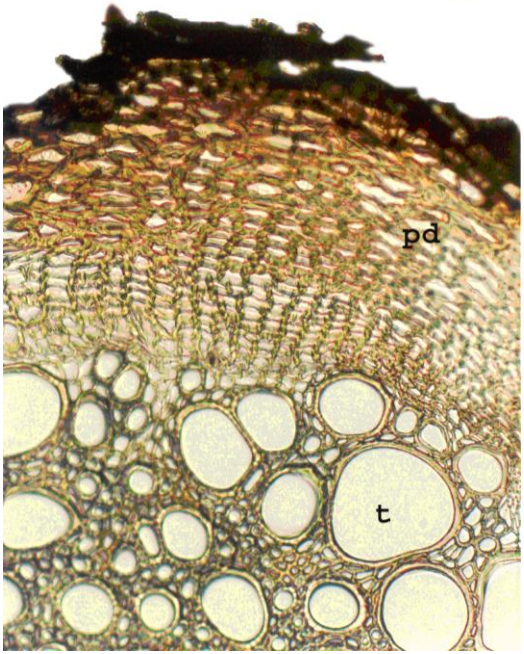

Fig. 1. Cross section of the root X10, pd. periderm, t. trache.

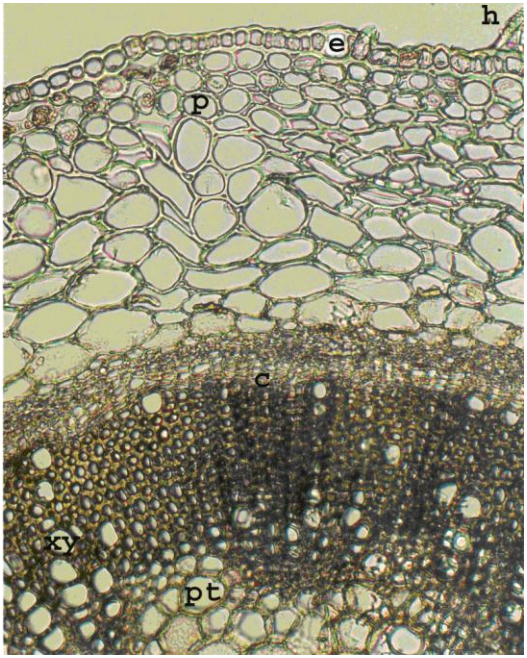

Fig. 2. Cross section of the stem X10, h. hair, e. epidermis, p. parenchyma, c. cambium, xy. xylem, pt. pith.

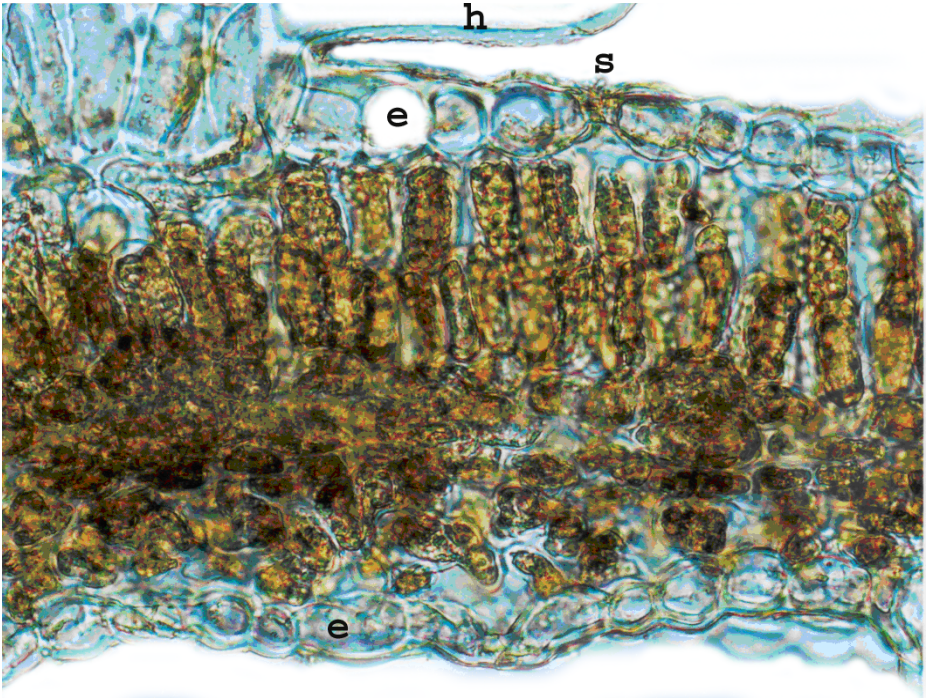

Fig. 3. Transversal section of leaves X10, e. epidermis, s. stomatas, h. hair.

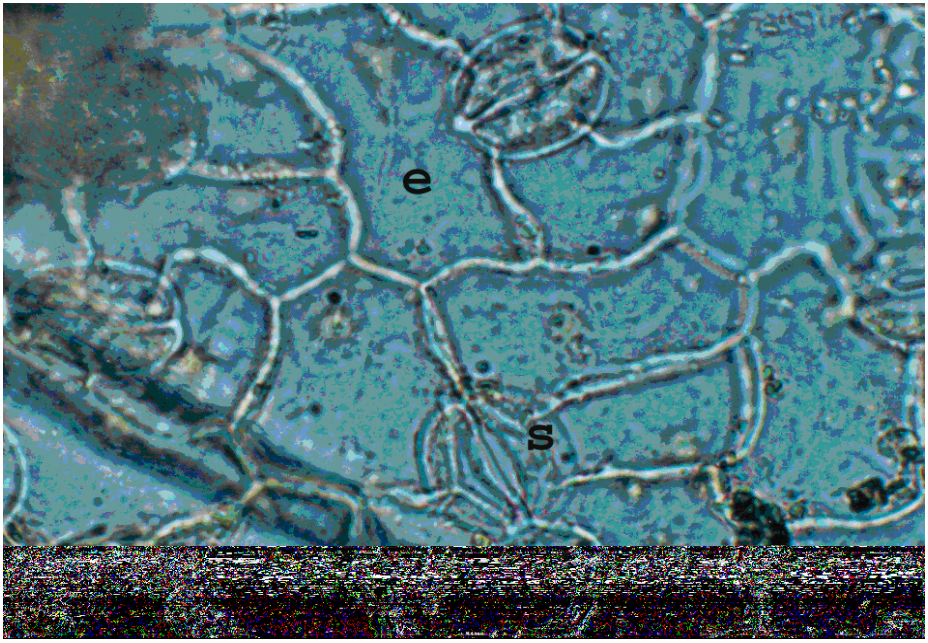

Fig. 4. The upper surface of the leaf X40, e. epidermis, s. stomatas.

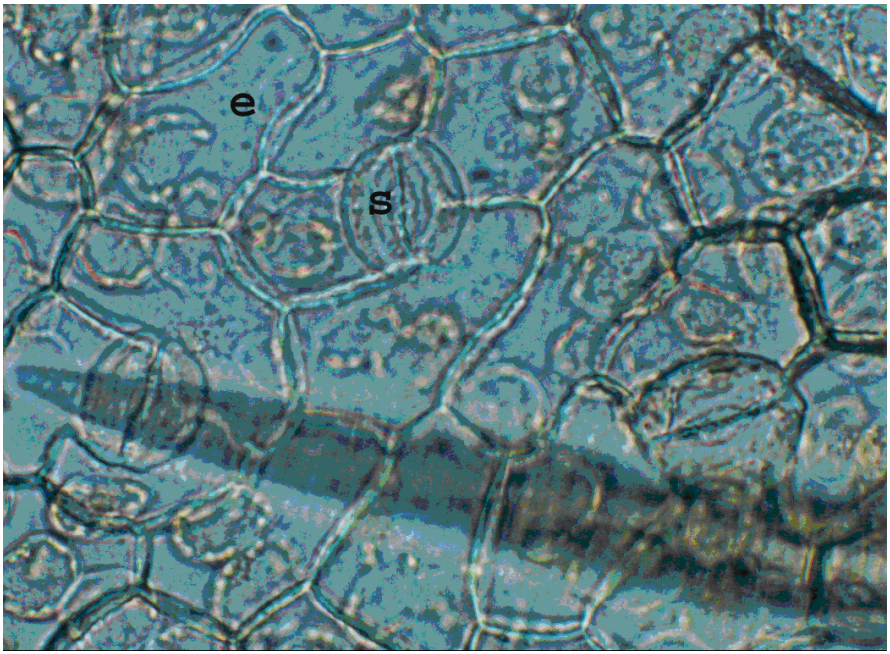

Fig. 5. The lower surface of the leaf X40, e. epidermis, s. stomatas.

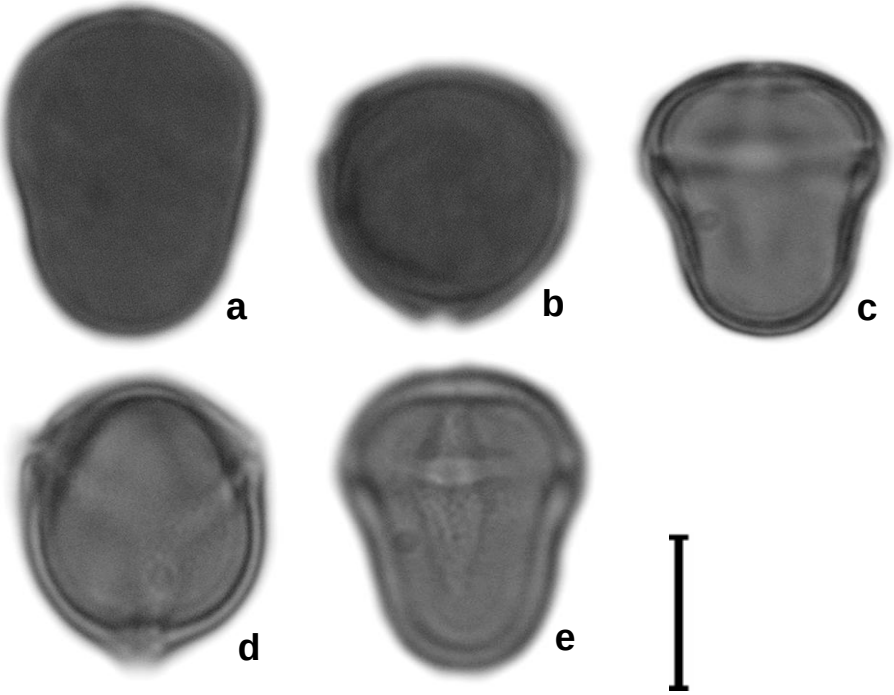

Fig. 6. Pollen grains in LM. (a (W), b, c (E): equatorial view, d (W), e (E): polar view) (scale 10 μm).

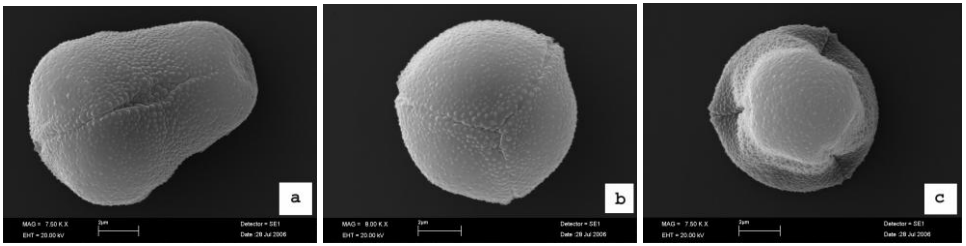

Fig. 7. Pollen grains in SEM. a. equatorial view; b, c. polar view.

Palynological Results

Onosma mersinana Riedl, Binzet & Orcan
Voucher specimens: C5: Mersin, Müğlü deresi, stoney slopes, 1100 m, N 36^0 49', E 34^0 16', 04.05.2004, Binzet 17.
Pollen type: Syncolporatae
Pollen shape: Prolat P/E: 1.39 (W); subprolat P/E: 1.22 (E)

		Fresh pollen		**Fosilize pollen**	
		M	**σ**	**M**	**σ**
P	:	16.47 µm	± 0.57 µm	15.86 µm	± 0.78 µm
E	:	11.70 µm	± 0.44 µm	13.15 µm	± 0.72 µm
plg	:	2.82 µm	± 0.44 µm	1.04 µm	± 0.20 µm
plt	:	3.48 µm	± 0.58 µm	7.02 µm	± 0.79 µm
clg	:	11.86 µm	-	14.24 µm	-
clt	:	2.80 µm	-	3.06 µm	-
Ex	:	0.35 µm	-	0.77 µm	-
i	:	0.72 µm	-	-	-
t	:	7.59 µm	-	7.10 µm	-
Structure	:	Tectatae ect/end ≅ 1/2 (W,E). Intrastructure			
Sculpture	:	Reticulate.			
Apertürler	:	Colpus and pores borders are clear and colpies are joined at wide poles (heteropolar). plg/plt: 0.81 (W); 0.14 (E).			

Abbreviations: P: polar axis, E: equatorial axis, P/E: polar to equatorial diameter ratio, plt: pore wideness, plg: pore length, clt: colpi wideness, clg: colpi length, ex.: exine, i: intine, t: an edge of polar angular. (W): Wodehouse method, (E): Acetolysis method.

Discussion

In this study, anatomical and palynological properties of endemic *O. mersinana* were determined. Although our anatomical and palynological results generaly agree with the previous studies, some differences have been also identified. Anatimical features and palynological characteristics of the examined species is compared with the other studies Tables 1 & 2.

References

Akçin, Ö.E. and A. Engin. 2001. *Onosma isauricum* Boiss. & Heldr. ve *Onosma stenolobum* Hausskn. ex H. Riedl. Türleri üzerinde karşılaştırmalı morfolojik ve anatomik bir araştırma. *Ot Sistematik Botanik Dergisi*, 8: 2, 75-95.

Aytuğ, B. 1967. *Polen Morfolojisi ve Türkiye'nin Önemli Gymnospermleri Üzerinde Palinolojik Araştırmalar*, İst. Üniv. Orman Fakültesi Yayınları, Kutulmuş Mataası, İstanbul, ss. 87

Binzet, R. and N. Orcan. 2003. Morphological and Palynological Studies on *Onosma roussaei* DC. and *Onosma giganteum* Lam. (Boraginaceae). *The Herb Journal Of Systematic Botany*, 10(1): 57-76.

Binzet, R. and N. Orcan. 2003. Morphological, anatomical and palynological study of *Onosma bracteosum* Hausskn. & Bornm., and *Onosma mutabile* Boiss. (Boraginaceae). *Phytologia Balcanica*, 9(1): 97-111.

Binzet, R. and N. Orcan. 2007. A new species of *Onosma* L. (Boraginaceae) From Southern Turkey. *A Journal for Botanical Nomenclature* 17: 8-10.

Erdtman, G. 1952. *Pollen Morphology and Plant Taxonomy*, Upsala, p. 472.

Ihsan A. Al-Shehbaz. 1991. The Genera of Boraginaceae in The Southern United States, *Journal of The Arnold Arboretum*, 1: 1-169.

Metcalfe, C.R. and L. Chalk. 1950. *Anatomy of the Dicotyledones*, Volume 1. Oxford. p. 724.

Qureshi, U.S. and M. Qaiser. 1987. Palynological study of *Onosma* (Boraginaceae) from Pakistan. *Pak. J. Bot*., 19(1): 99-105.

Riedl, H. 1974. Two new species of *Onosma. Notes Roy. Bot. Gard. Edinburgh*, 33(2): 301-303.

Riedl, H. 1978. In: *Flora of Turkey and the East Aegean Islands*, 6: 237-437. (Ed.): P.H. Davıs. Edinburgh University Press.

Riedl, H., R. Binzet and N. Orcan. 2005. A new species of *Onosma* (Boraginaceae-Lithosprmae) from Southern Turkey. *Edinburgh Journal of Botany*, 61(2&3): 127-130.

Wodehouse, R.P. 1965. *Pollen Grains*. Hafner Publishing Company, New York and London. 106-109.

Yıldırımlı, Ş. 2000. The chorology of the Turkish species of Boraginaceae Family, *The Herb Journal Of Systematic Botany*, 7(2): 257-272.

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