

Anatomical and Palynological Studies on Endemic *Klasea yunus-emrei* (Asteraceae)

Okan Sezer^{a,*} and İsmühan Potoğlu Erkara^a

^a Eskişehir Osmangazi University, Department of Biology, 26480, Eskişehir-Turkey

***Corresponding author: oksezer@ogu.edu.tr**

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ABSTRACT

In this study, anatomy and pollen morphology of *Klasea yunus-emrei* was studied with light and electron microscopies. The purpose of the present study is to anatomical and palynological characteristics of the endemic Turkish taxon *K. yunus-emrei* (Asteraceae) that show natural distribution in Turkey. B3 Eskişehir: Alpu, plantation area of Bozan, calcareous soils, 2014-2017, OUFE 17594 Eskişehir. Upon the examination of the root cross-sections in *K. yunus-emrei*, the pith was determined to be completely covered by xylem cells. As to stem cross-sections, it was observed that large parenchymatic cells were present in the pith of the stems. Leaves are equifacial and amphistomatous and they have amaryllis type stomata. Leaves are mesomorphic. Stomata are anisocytic. The results of the light and scanning electron microscope investigation revealed pollen grains of *K. yunus-emrei* are tricolporatae, amb shape triangular, pollen shape spheroidal. Exine tectatae-echinatae.

Keywords: Asteraceae, *Klasea yunus-emrei*, anatomy, pollen morphology

INTRODUCTION

Klasea is naturally distributed in Central Asia, Iran, Turkey, the Mediterranean region, China and the Himalayas, SE Europe and southern Russia. Populations of these endemic Asteraceae taxa are very sensitive to changes in their environs caused from biotic and abiotic environmental factors. The genus *Klasea* was revised by Davis and Kupicha for the flora of Turkey. According to him, *Klasea* is represented by 15 species and *Serratula* is represented by one species within the Mediterranean and Irano-Turanian phytogeographic regions of Turkey. Five of these species are endemic to Turkey, resulting in an endemism ratio of 33.3%. However, since that revision several new taxa have been added in the last three decades. In the flora of Turkey, 16 species were reported for the genus *Serratula* in Turkey. All *Serratula* species were transferred to genus *Klasea* except *Serratulatinctoria*. Thus, *Klasea* is represented by 15 species and *Serratula* is represented by one species within the Mediterranean and Irano-Turanian phytogeographic regions of Turkey. Five of these species are endemic to Turkey, resulting in an endemism ratio of 33.3% (Davis 1965-1985, 1988). In this study, anatomy and pollen morphology critically endangered *Klasea yunus-emrei* which was firstly described from plantation area of Alpu/Bozan (Eskişehir) were monitored between 2014-2017.

MATERIALS AND METHODS

During a field trip, some specimens were collected belonging to the genus *Klasea* in central Anatolia, Eskişehir province. The plant was identified based on fresh material and the dried samples were preserved in Eskişehir Osmangazi University Herbaria (OUFE). Samples for anatomical studies were kept in 70% alcohol until the sections were prepared. For the determination of anatomical characteristics of the plants, cross-sections of roots, stems and leaves were carried out manually. The sections were photographed by the Kameram digital camera fitted to a Nikon 80i type microscope. For palynological studies pollen material

was obtained from dried flower specimens. The pollen morphology of the taxon was investigated through light and scanning electron microscope (SEM). Faegri and Iversen's (1975) terminology for the names of the exine layers were used. Light microscopy of the pollen samples was carried out after Wodehouse (1935) and Erdtman (1969). For scanning electron microscopy (SEM), unacetolyzed pollen grains were directly placed onto stubs, sputter-coated with gold and examined with a Jeol 5600 LV scanning electron microscope (Walker 1974a,b). Terminologies used for pollen morphology were proposed by Wodehouse (1935), Erdtman (1969) and Faegri and Iversen (1975).

RESULTS AND DISCUSSION

Anatomical properties: There is a periderm layer on the outer surface of the root. Parenchymatous cortex is present under the periderm. Phloem occupies a narrow area with 2-3 layer cells. Cambium cells are distinguishable. The pith was determined to be completely covered by xylem cells (Fig. 1).

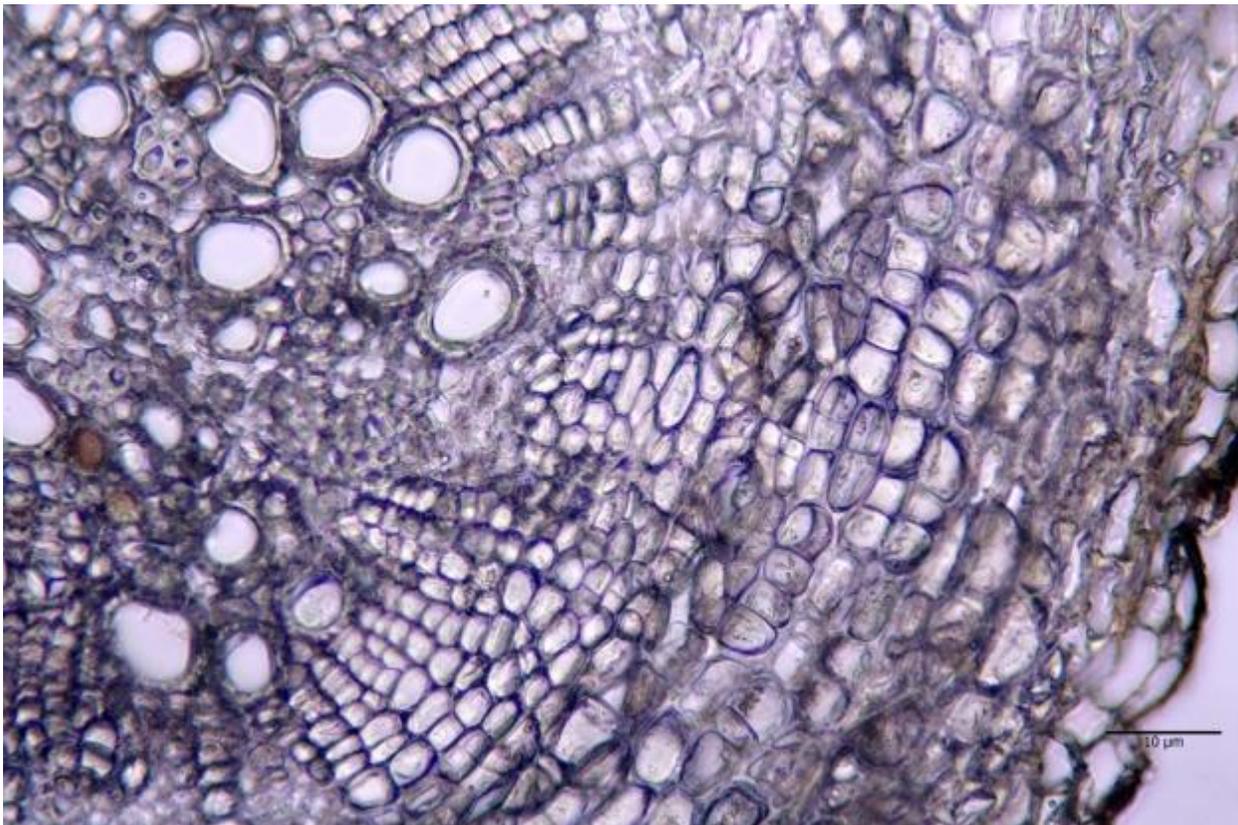


Fig. 1. *Klasea yunus-emrei* root transverse section

Stem has a thick cuticle with small-celled epidermis. Cortex is 5 - 6 layered and parenchymatous. There is a 5 - 6 layered collenchymatous tissue. Dense sclerenchymatous cells located on the phloem tissue which occupies a small region. Xylem consists of xylem vessels and a sclerenchymatous parenchyma. A few primary xylem elements are present below the secondary xylem. Cambium is not distinguishable and the pith region is large and parenchymatic (Fig. 2).

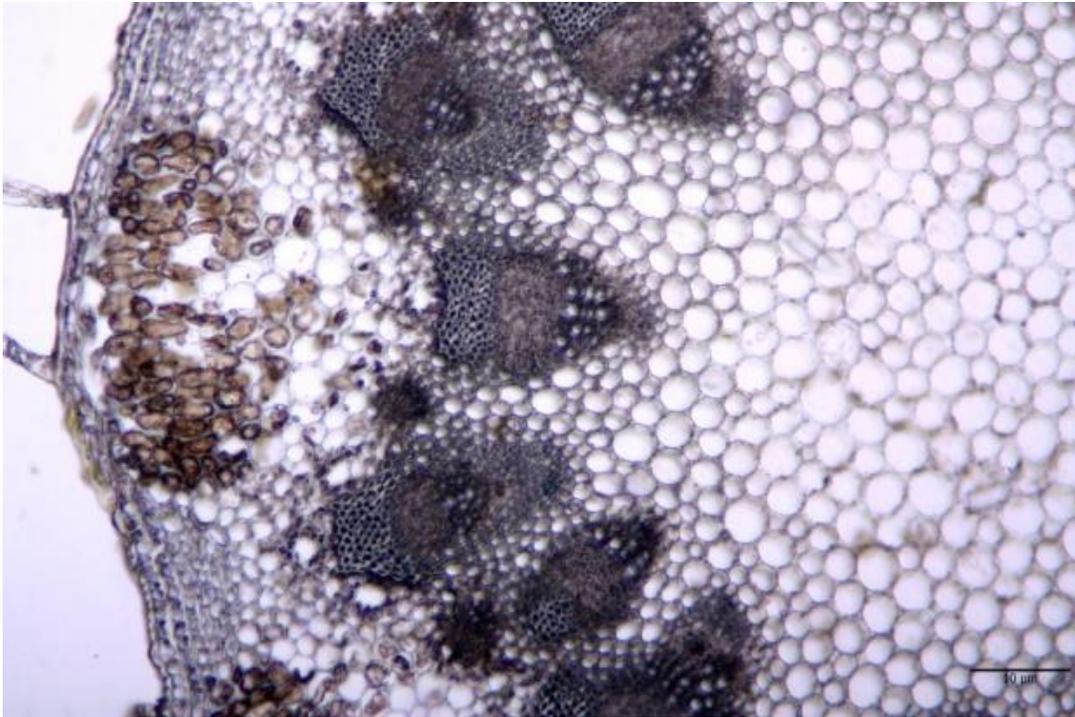


Fig. 2. *Klasea yunus-emrei* stem transverse section

In leaves the upper epidermis consists of flat-ovoidal cells and the lower epidermis is made up of cells having same length and breadth. Stoma cells are present both in the upper and in the lower epidermis. Palisade parenchyma cells are two-layered. The Leaves are equifacial and amphistomatous and they have amaryllis type stomata. They are mesomorphic. Stomata are anisocytic (Fig. 3).

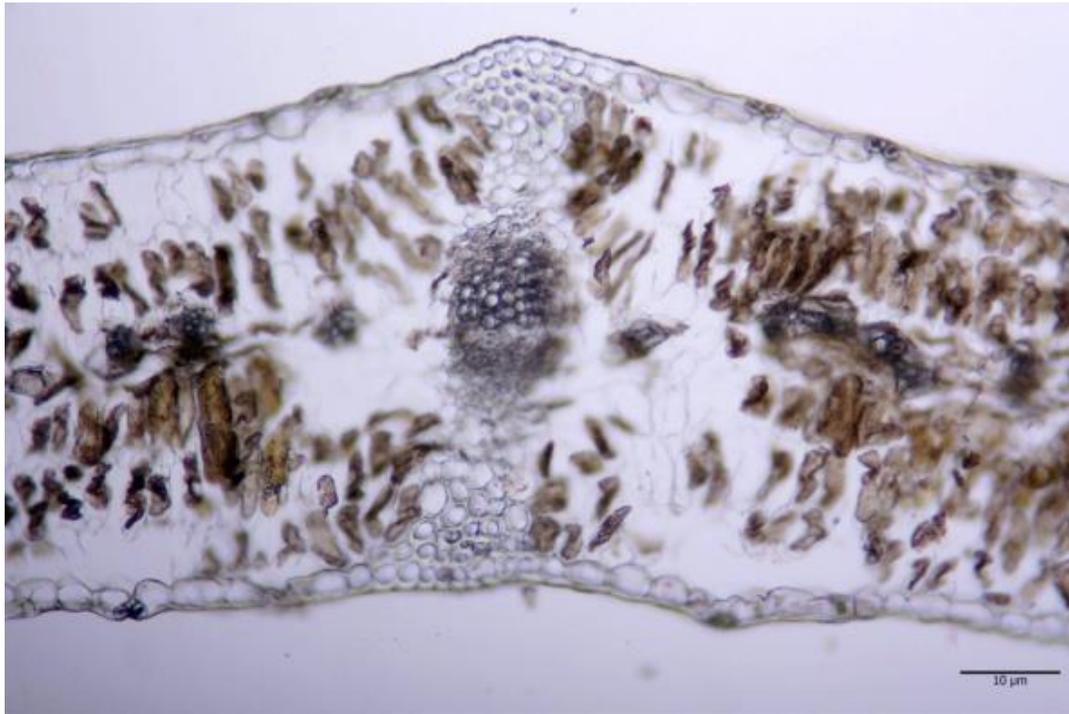


Fig. 3. *Klasea yunus-emrei* leaf transverse section

Palynological properties: Pollen grains of *K. yunus-emrei* are tricolporatae, amb shape triangular, pollen shape spheroidal. Exine tectatae-echinate. P/E=1.18 (N), 1.10 (A). The polar axis measured 35.48 μm (N), 32.2 μm (A), and the equatorial axis 30 μm (N), 29.28 μm (A), Amb was triangular and 32.28 μm (N), 28.46 μm (A) in diameter. The apocolpium was 11.44 μm (N), 10.64 μm (A) in diameter. Exine 1.62 μm (N), 1.86 μm (A). The exine has one layer of columellae beneath spines, microspine length 0.5 μm , and spinule width 1.1 μm . Exine tectate-echinate, 86 spinule in 100 μm^2 and average distance between spinules 0.6 μm . Colpi ends are rounded Clg 26.28 μm (N), 23 μm (A), Clt 3.6 μm (N), 5.96 μm (A). The pores are transversely elongated; Plg 9.48 μm (N), 10.36 μm (A), Plt 7.28 μm (N), 7.2 μm (A). The pore latitude is wider than the colpi latitude. The surface ornamentation is tectatae-echinate under LM and SEM (Fig. 4).

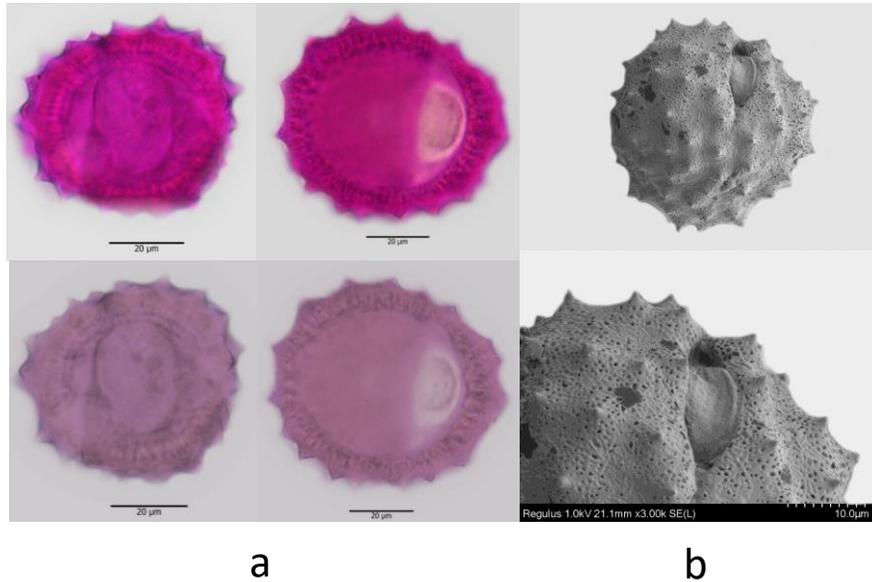


Fig. 4. *Klasea yunus-emrei* Pollen Morphology. a) In Light Microscope b) In SEM

In this study, We were used alot of anatomy and morphology books. There are parelence with our findings (Esau 1967, Fahn 1982, Metcalfe and Chalk 1983, Yentür 1995).

The essential criteria to determine the phylogenetic relationship between the characteristics of aperture and exine function of this species has been reported earlier (Kuprinova 1967, Cronquist 1968, Walker 1974a-b, Takhtajan 1980). In the present study, the karyological information for the species has been gathered for the first time which is consistent with other closer taxa (Cronquist 1968). The study enlights systematic-phylogenetic relationship of the species. Its anatomical and palynological structure contributes a better explanation to consider the usefulness of morphology in distinguishing the character traits possessed by a species.

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