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Pollen Morphology of Some Species of *Verbascum* (Scrophulariaceae) in Urmia

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Abstract: Pollen morphology of seven species was investigated by light and Scanning Electron Microscopy (SEM). Pollen grains are monad and elliptic to oblique at the equatorial view, circular-triangle at the polar view, trizonocolporate, isopolar and spheroidal prolate, prolate or perprolate. The pollen is small or medium sized in *V. szovitsianum* Boiss., *V. agrimonifolium* (C. Koch) Hub-Mor., *V. mucronatum* Lam., *V. sinuatum* L., *V. macrocarpum* Boiss., *V. oreophilum* C. Koch var. *oreophilum* and *V. cheiranthifolium* Boiss., Exine ornamentation is reticulate but in *V. agrimonifolium* (C. Koch) Hub-Mor., it is microreticulate.

Key words: SEM, LM, morphology, pollen grain, *Verbascum*

INTRODUCTION

Verbascum includes 300 species worldwide (Huber-Morath, 1978) and 46 species (including hybrids) (Ghahreman and Attar, 1999) and is the largest genus in scrophulariaceae, subfamily Verbascoideae, tribe Verbaceae (Valdes, 1987). Hybrides are frequent in *Verbascum*. It is a southwestern Asian genus centered in Turkey, Iran and Pakistan (Zohary, 1973). It is the endemic of Turkey.

Morphology and anatomy of fruits and seeds have shown similarities among the species of *Verbascum* in southern Spain (Juan *et al.*, 1997). Foliar idioblasts have been reported in the anatomy of leaves in some of the species and there is a report about *Verbascum*'s affinity with *Scrophularia* (Lersten and Curtis, 1997). Molecular data shows relationship for *Scrophularia* and *Verbascum* according to *ndhf*, *rps2*, *rbcL* genes (Olmstead *et al.*, 2001). Pollen morphology of some species of the genus has been examined by many researchers (Dane and Yilmaz, 2002; Moor and Webb, 1978). However there are almost no reports on the pollen morphology of the species found in Urmia.

MATERIALS AND METHODS

Materials used for this study was collected from wild populations around Urmia. Mature pollen grains of seven species were obtained from dried herbarium specimens. Pollen grains were acetolized using the technique

presented by Erdtman (1960). Morphological observations were made in a Philips LX30 Autoscan SEM and LM BX40 Olympus.

RESULTS

The structure of pollen wall was found to be rather uniform in all investigated taxa. The tectum surface is reticulate-microreticulate and all the pollen grains are tricolporate and have the polar diam that range from 25.08 to 41.38 μm and the equatorial diam that range from 15.04 to 35.11 μm .

The polar equatorial diam ratios (P/E) of pollen grains show that shapes are prolate, prolate spheroidal to perprolate.

The colpi are distinct, the colpus membranes are covered sparsely. The shape of the colpi are fusiform. The pollen grains are isopolar.

Apocolpium is present on all pollen grains where colpi are three at the poles.

***Verbascum szovitsianum* Boiss.:** Pollen grains prolate to prolate spheroidal, polar axis 25.08-36.36 μm and the equatorial diam 16.30-30.09 μm (P/E ratio 1.04-1.93) outline at the polar view mostly circular to subtriangular with convex sides, outline at the equatorial view prolate to elliptic. Tectum reticulate (Fig. 1A-C).

***Verbascum agrimonifolium* (C. Koch)Hub-Mor.:** Pollen grains prolate to prolate spheroidal, polar axis 25.08-

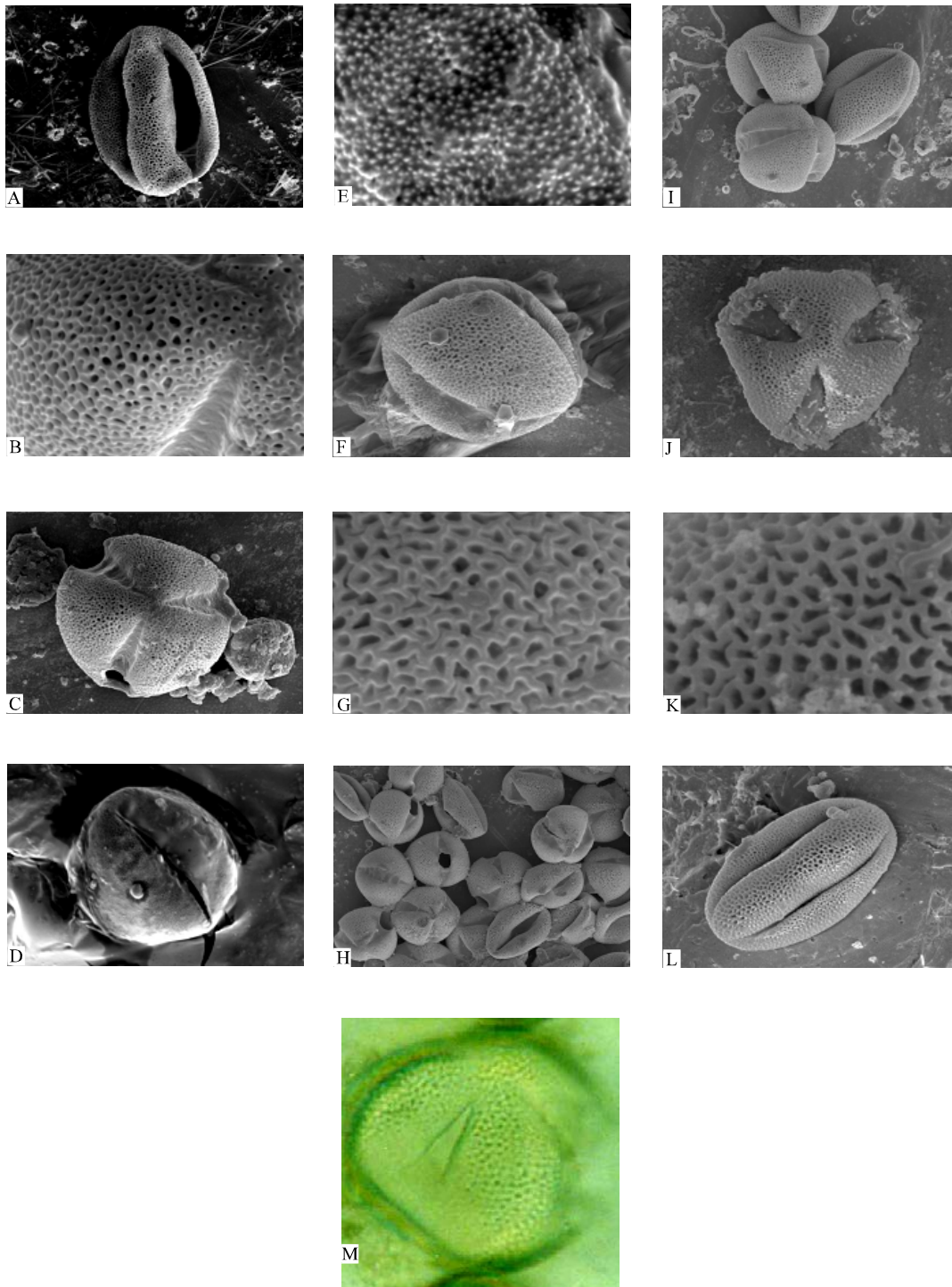


Fig. 1: A-C: *Verbascum szovitsianum*; (A) equatorial view scale bar 10 mm; (B and C) Polar view (B) scale bar 2 μ m (C) scale bar 10 μ m, D-E: *V. agrimonifolium*, (D) polar view scale bar 20 μ m; (E) details of ornamentation scale bar 2 μ m, F-G: *V. mucronatum*; (F) details of ornamentation scale bar 2 μ m; (G) polar view scale bar 5 μ m, H-I: *Verbascum sinuatum* (H) polar view scale bar 20 μ m (I) polar view scale bar 10 μ m, J-K: *V. macrocarpum* (J) polar view scale bar: 5 μ m; (K) details of ornamentation scale bar 2 μ m; (L). *V. oreophilum* equatorial view scale bar 5 μ m

37.62 μm and the equatorial diam 15.048-30.96 μm (P/E ratio 1.08-2).

Outline at the polar view mostly circular to subtriangular, outline at the Equatorial view mostly prolate. Tectum microreticulate, reticulate supragemmate (Fig. 1D and E).

***Verbascum mucronatum* Lam.:** Pollen grains prolate to prolate spheroidal, polar axis 25.08-40.12 μm , equatorial diameter 15.48-28.84 μm (P/E ratio :1.1-2)

Outline at the polar view mostly circular, outline at the equatorial view mostly oblate circular. Tectum reticulate (Fig. 1F and G).

***Verbascum sinuatum* L.:** Pollen grains prolate to prolate spheroidal, polar axis 25.08-37.62 μm , equatorial axis 15.04-25.08 μm (P/E ratio 1.25-1.85) Outline at the polar view mostly circular, outline at the equatorial view prolate. Tectum reticulate. The size of pore 4.43-5.17 μm in length and 2.39-3.37 μm in width, apertures lolongate. Colpi clear without granules (Fig. 1H and I).

***Verbascum macrocarpum* Boiss.:** Pollen grains prolate to prolate spheroidal to perprolate, polar axis 25.08-41.38 μm . The equatorial diam 15.04-35.11 μm (P/E ratio: 1.12-2.07). Outline at the polar view mostly subtriangular. Outline at the equatorial view prolate, elliptic. The colpus surface is granular sparsely. Tectum reticulate with extended muries (Fig. 1J and K).

***Verbascum oreophilum* C. Koch var. *oreophilum* (BORDZ) Hub-Mor.:** Pollen grains prolate to prolate spheroidal, polar axis 25.08-35.11 μm and the equatorial diam 15.048-28.84 μm (P/E ratio:1.09-1.83) outline at the polar view circular, outline at the equatorial view oblique. Tectum reticulate (Fig. 1L).

***Verbascum cheirantifolium* Boiss.:** Pollen grains prolate to prolate spheroidal, polar axis 25.08-35.11 μm and equatorial axis 15.048-28.84 μm (P/E ratio:1.09-1.83), outline at the polar view circular to subtriangle, outline at the equatorial view oblique. Tectum reticulate (Fig. 1M).

DISCUSSION

The results from present observation show that all *Verbascum* species have the same basic type of pollen morphology (reticulate). All the taxa examined are essentially similar in pollen morphology and have the same basic shape-their pollen grains are spheroidal

prolate or prolate to perprolate. Tricolporate with three long tapering furrows and lolongate pori. These data support the results given by other workers on the other species of *Verbascum* (Dane and Yilmaz, 2002).

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