Pollen Morphology of Malvaceae in Iran: A Case Study to Complete Pollen Atlas of Iran

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Abstract

The pollen grains of 34 species of eleven genera belonging to three subfamilies (Malvoideae, Grewioideae, Tilioideae) of Malvaceae were studied by scanning electron microscopy (SEM). Pollen grains of the studied taxa were radially symmetrical and principally spheroidal, except *Grewia makranica* Rech.f. & Esfand (prolate), *Tilia cordata* Miller, and *Tilia rubra* Dc. (suboblate). Apertures included tricolporate (*Tilia cordata* and *Tilia rubra*) to pantaporate (*Malvella sherardiana* L., *Malva verticillate* L., *Malvalthaea transcaucasica* (sosn.) Iljinand *Alcea sulphurea* (Boiss. & Hohen). Sculpturing was comprised of echinate, microechinate, baculate, granulate, and perforate types. Some qualitative traits in pollen grains are unique to one or a few genera. The observed variations in pollen characteristics are very useful for the delimitation of subfamilies and in some cases are generic specific but these characters are not functional in separating taxa at a specific level or distinguishing suggested species groups in some genera such as *Alcea* L.. Our results add further support to the current classification of Malvaceae which recognizes the subfamilies Tilioideae, Grewioideae, and Malvoideae but there was no character state in pollen grains to be synapomorphic for Malveae, Hibisceae, and Gossypieae. On the other hand, our results support the separation of *Alcea* from *Althaea*. The PCA analysis represents two clades. The first clade contains both subfamilies Grewioideae and Tilioideae. The second clade contains all genera belonging to the subfamily Malvoideae The resulting study emphasizes that some palynological characteristics represent high systematic value, so can be useful for systematic differentiation of Malvaceae. However, palynological evidence along with other characteristics, can be effective in solving the systematic challenges of this family.

Keywords: Micromorphology, *Alcea*, Phylogeny, Taxonomy, Iran

Introduction

Plants of the Malvaceae family possess morphological plasticity which gives rise to taxonomical discrepancies at both family and genus levels (Alverson et al., 1999; Carvalho-Sobrinho et al., 2016; 2002; Tate et al., 2005). Because of this characteristic, the family is divided into nine

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