



Pollen Variations among some Cultivated Citrus Species and its Related Genera in Egypt

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Abstract

The present investigation aims to study the pollen morphology and ultrastructure of pollen grain characteristics for nine Citrus species and three related genera cultivated in Egypt. The pollen grains were photographed by using both Light Microscope (LM) and Scanning Electron Microscope (SEM). Twelve qualitative and quantitative pollen morphological characters were used to differentiate among the studied taxa. Statistical analysis of palynological data indicated that the pollen size, shape, colpi length, apertures number and type, ora size, amb shape, mesocolpium diameter, and the exine ornamentation were the most distinguished characters in the circumscription of the studied taxa and were of taxonomic value. On the contrary, the other studied pollen characters including the ratio between Polar length/Equatorial diameter (P/E), ora shape and exine thickness were not found to be of taxonomic value.

Introduction

Many Citrus types were identified and named by individual taxonomists, resulting in a large number of identified species: 870 by a 1969 count [1]. Citrus plants belong to family Rutaceae, they are characterized by having different life forms as trees and shrubs. Citrus species may frequently contain aromatic compounds with pellucid glands on the stems, leaves and fruits. The leaves are usually opposed, compound and without stipules, sometimes with thorns [2]. According to Engler

[3], Rutaceae is divided into seven subfamilies, he defined these subfamilies primarily by gynoecium characters especially the fruit type. Citrus species and its related genera are closely related and all belong to subtribe Citrinae, tribe Citreae, of the orange subfamily Aurantioideae. The Citrus fruit is of berry or hesperidium type. Species within the genus Citrus are highly Distinguishing of Citrus species and related genera according to morphological and geographical distribution are very difficult because Citrus contains an enormous degree of genetic variation, with abundant natural hybridization [13]. The classification of the genus Citrus are complex and the precise number of natural species is unclear, as many of the named species are hybrids clonally propagated through seeds (by apomixes) and there is genetic evidence that even some wild, true-breeding species are of hybrid origin [4,14]. As a result of hybridizations between Citrus species, there is confusion around correct botanical names of commonly known Citrus [10,15]. In Egypt, there are no wild Citrus species [16]. All the present species are introduced and cultivated. Now, Egypt is considered as one of the most leading countries in cultivating and exporting orange, ranking as the sixth-largest producer and the second-largest exporter in the world [17]. The use of pollen morphological characters is important in plant taxonomy, as Davis and Heywood [18] indicated. The use of pollen morphology in solving taxonomic problems has been used for a long time ago [19-26]. This work is considered as a step in finding way in differentiating between nine Citrus species and its related genera.

**Keywords**

Citrus; Fortunella margarita; Limequat hybrid; Pollen morphology; Poncirus trifoliata; Rutaceae

Discussion

Pollen morphology has been used since a long time ago in solving taxonomic problems at different levels; families, genera and species [19,23,27,30] Genus Citrus and its related two genera: Fortunella and Poncirus are considered one of the important economic and medicinal fruits in the world, they are rich plants in vitamin C and volatile oils. The problem within these taxa is the frequent hybridizations between their species, which made their taxonomy very confusing. The classification and species delimitation of the genus has long been a controversial issue by a number of authors as Swingle [11], who included only 16 species in Citrus, while Tanaka [9] described 162 species, but Scora [15] and Barrett and Rodes [31] defined only three true species within the genus Citrus, which are Pummelo (*C. grandis* L. Osbeck), Citron (*C. medica* L.) and Mandarin (*C. reticulata* Blanco.). They indicated that all other Citrus species resulting from hybridization between these basic species. Later, Scora [32] added another true species *C. halimii* Stone.

References

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