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Full Length Article

Morphological studies of the pollen grains for some hydrophytes in coastal Mediterranean lakes, Egypt

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ABSTRACT

The pollen grains of forty species of the aquatic flowering plants (6 floating, 6 submerged and 28 emergent species) naturally growing in the four coastal Mediterranean lakes of Egypt were investigated during January–August 2012. These species belong to 17 families. Morphologically, the investigated pollen grains are mostly prolate-spheroidal, spheroidal or triangular, rarely prolate or elongated, tectum psilate, granulate, reticulate or microechinate. On the basis of aperture types pollen grains of most families are grouped under three distinct types, namely colpate, colporate and porate. On the other hand, pollen grains of some families e.g. Cyperaceae, Juncaceae, Potamogetonaceae and Ruppiaceae are inaperturate. It is worth to stating that from a phylogenetic and evolutionary point of views, polarity, symmetry, apertural types and exine sculpturing are the most important characters to differentiate between the different pollen types. The identified pollen grains, conserved in the herbarium of Botany Department, Faculty of Science, Mansoura University, Mansoura, Egypt, as reference key pollen in the northern lakes for palynologists, ecologists, taxonomists etc.

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1. Introduction

Through the palynology we can get tremendous knowledge from a little material in a short time [1]. Palynology is used in several applications such as a survey of atmospheric pollen, spore production and the archaeological excavation of shipwrecks. The earliest investigation to use the morphological diversity of pollen directly concerned with the classification of plants [2]. Lindau [3] used a greater number of pollen

characters including shape and ornamentation as well as aperture number, to define a range of pollen types.

Morphology of pollen is involved in solving some taxonomic problems on the family, generic or specific level and has become part of the multidisciplinary and collaborative approach in plant systematic and evolution [4–6]. The sculpturing of the exine and the constant features make pollen grains appreciably recognizable feature through which parent genera or even species can be recognized [7,8].

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Several papers are published on pollen morphology of some dicots families from various parts of the world. Anacardiaceae, Bignoniaceae, Caricaceae, Myrtaceae, Moringaceae, Meliaceae, Rhamnaceae and Zygophyllaceae have been studied by [9]. Palynology of families Apocynaceae has been investigated by Schill and Leuenberger [10] and Van Campo et al. [11]. The families Caesalpiniaceae and Mimosaaceae have been reported by Guinet [12] and Lock [13]. Morphology of pollen six aquatic angiosperms from Saudi Arabia has been studied by Perveen and Qaiser [14]. The main aims of this study are to contribute to our understanding the pollen morphology of aquatic plants naturally growing in four northern Mediterranean lakes of Egypt namely: Mariut, Idku, Burullus and Manzala by light microscopy and to be used as additional tool for plant taxonomy.

2. Materials and methods

2.1. Study area

The studied northern coastal Mediterranean lakes of Egypt are Lake Manzala, Lake Burullus, Lake Idku and Lake Mariut (Fig. 1). They are separated from the sea by strips of land that are very narrow in several places and are connected with the sea through narrow outlets (straits). Three lakes (Manzala, Burullus, Idku) receive the main bulk of the drainage water from the Nile Delta.

Lake Manzala (Long. $31^{\circ} 50' - 32^{\circ} 15'$ E and Lat. $31^{\circ} - 31^{\circ} 30'$ N) is the largest of the northern deltaic lakes of Egypt. Its area is about 1400 km^2 [15]. Lake Burullus lies on the eastern side of the Rosetta Branch of the River Nile occupying a central

position along the Mediterranean coast of the Nile Delta. It extends eastwards from Longitudes $30^{\circ} 35'$ to $31^{\circ} 8'$ E and northwards from Latitudes $31^{\circ} 21'$ to $31^{\circ} 37'$ N. It is the second largest natural lake in Egypt, with an area of about 410 km^2 [16]. Lake Idku is situated west of the River Nile delta between Longitudes $30^{\circ} 8'$ to $30^{\circ} 28'$ E and Latitudes $31^{\circ} 10'$ to $31^{\circ} 8'$ N. Lake Mariut (Long. $29^{\circ} 89'$ E and Lat. $31^{\circ} 15'$ N) is the smallest of the northern Mediterranean lakes of Egypt.

Ayyad et al. [17] stated that, the Mediterranean coastal region of Egypt belongs to the dry arid climatic zone of Koppen's [18] classification system. The study area lies in Meig's warm coastal deserts [19] in which summer is warmest month with mean monthly temperature less than 30°C , and winter is coldest month with mean monthly temperature above 10°C .

2.2. Pollen extraction

Pollen grains were extracted from fresh flowers of thirty seven aquatic species collected from the northern Mediterranean lakes during March–August 2012. Extraction and chemical preparations procedures of the flowers and pollen used is that described by Moore et al. [20]. Also, original pollen grains sizes were the mean values of the longest axis of 15 measured grains. The herbarium specimens of the studied plants were kept and well preserved at the herbarium of the Faculty of Science, Mansoura University, Mansoura, Egypt. Material for LM was acetolysed according to Erdtman [21]. Before acetolysis the pollens were boiled in 10% KOH for about 8 min, causing the apertures to open and making them easier to investigate [22]. The acetolysed pollens were mounted in glycerin jelly on glass slides. The pollen was examined using a

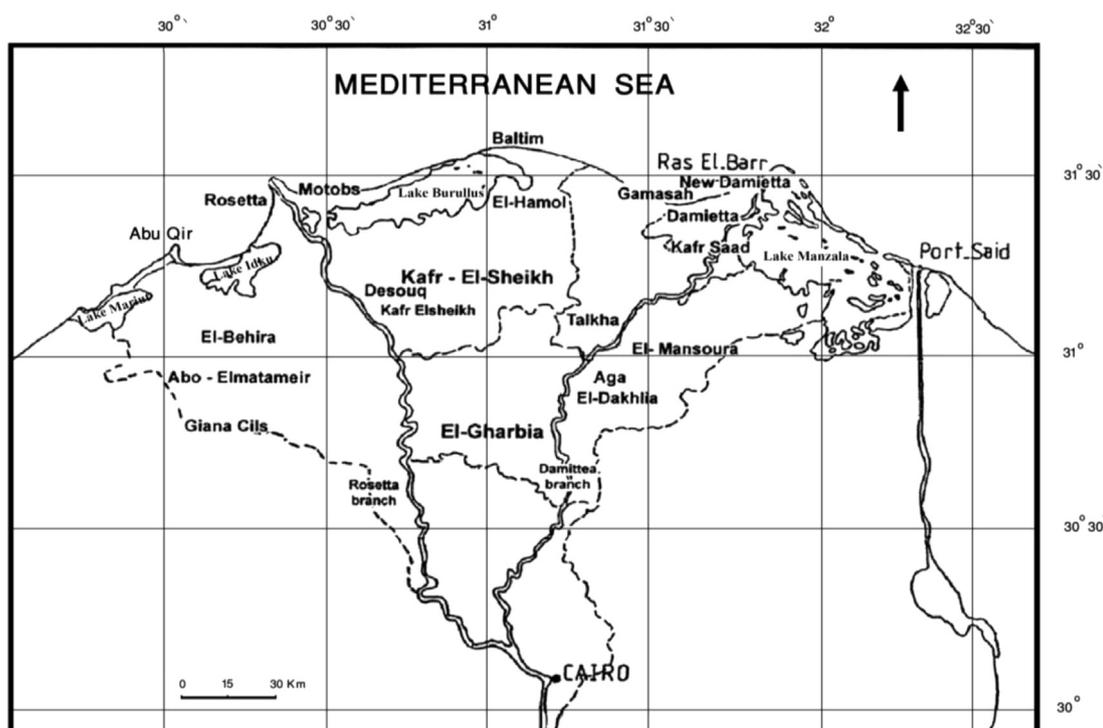


Fig. 1 – Map of the Nile Delta showing the coastal Mediterranean lakes of Egypt.

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