



**Faculty of women
For Art, Science and Education**

Ecological Distribution and Taxonomy of *Opuntia* sp. in Egypt, Based on Morphological Criteria and Molecular Genetic Structure

**A THESIS Submitted for Partial Fulfillment of
Master Degree of Plant Science in (Flora and Taxonomy)**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿أَلَمْ تَرَ أَنَّ اللَّهَ أَنْزَلَ مِنَ السَّمَاءِ مَاءً فَأَخْرَجْنَا بِهِ ثَمَرَاتٍ مُخْتَلِفًا
أَلْوَانُهَا وَمِنَ الْجِبَالِ جُدَدٌ بَيَضٌ وَحُمْرٌ مُخْتَلِفٌ أَلْوَانُهَا وَغَرَابِيبُ سُودٌ﴾
صدق الله العظيم

فاطر ٢٧



Dedication

I dedicate this work to

My dear father,

My great mother,

My sisters and brother,

My lovely husband Khalid.

My precious son Moustafa

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ABSTRACT

One hundred five stands (10m X 10m) distributed within thirteen sites located at four governorates (Qalyubiya, Minufiya, Buhayrah and Marsa Matrouh) were surveyed in autumn and spring of 2015 and 2016 to study the floristic composition of associated flora with *Opuntia* populations, cladodes and fruits of 18 accessions were collected for taxonomical (based on morphological characteristics and molecular genetics) and ecological study, in addition 13 soil samples were collected. The taxonomic study based on the morphological characteristics classified the 18 accessions of *Opuntia* into two distinct species, *Opuntia ficus indica* which distributed in Delta governorates and *Opuntia littoralis* found in Wadi Maged, Marsa Matrouh, Costal Mediterranean region. In addition, *Opuntia ficus indica* separated to three phenotypes according to the fruit characteristics. Molecular genetic data by using RAPD and ISSR technique support this classification and it was recorded specific marker bands for *Opuntia littoralis*, *Opuntia ficus indica* bearing yellow fruits and *Opuntia ficus indica* bearing reddish fruits. Therefore, *Opuntia ficus indica* in this study classified to three genotypes. Flora of the study sites represented 81 species of the Egyptian flora where they are belonging to 72 genera and 30 families. Poaceae represented the most dominant plants associated with *Opuntia* communities, followed by Asteraceae, Chenopodiaceae, Brassicaceae and Fabaceae. The application of TWINSpan on the cover estimates of 81 associated species recorded in the 105 sampled stands of Prickly Pear, led to the recognition of 10 vegetation groups. Soil of *Opuntia ficus indica* populations mainly constructed from silt and clay (loamy soil), while that of *O. littoralis* is sandy. Soil of *O. ficus indica* has low pH, CaCO₃, N and P but high EC, Organic matter, anions and cations than soil of *O. littoralis*. High concentrations of Fe, Zn and Mn were recorded in soils *O. ficus indica* but high concentrations of Cu, Co, Pb, Ni and Cd were recorded in soil of *O. littoralis*. All estimated heavy metals in soils of *Opuntia* were in allowable concentration according to World Health Organization (WHO). Growth traits of *Opuntia* trees and cladodes indicated high