Faculty of Science
Departement of Botany

Habitat and species diversity in some Wadis in Sinai Peninsula

Thesis

Submitted in
Partial Fulfillment
of the requirements for the
Master Degree of Science in Botany
(Plant Ecology)

By

Maged Mohamed Abu-Taha
B. Sc. (Botany) Helwan University (2004)

Presented to

Department of Botany
Faculty of Science
Ain Shams University

(2010)

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Dedication

To my Dear Parents

For their Pray to Allah for me,

To my Brothers

For their Endurance and Loving

Maged Mohamed Ali Abu-Taha

Acknowledgement

Before all and above off that's due to Allah for blessing me, the author wishes to express his deepest gratitude and grateful to Allah by grace and kind for the accomplishment this work.

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Maged Mohamed Abu-Taha

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

أَلَمْ تَرَ أَنَّ اللَّهَ أَنزَلَ مِنَ السَّمَاءِ مَاءً فَأَخْرَجْنَا بِهِ ثَمَرَاتٍ مُّخْتَلِفًا
أَلْوَانُهَا ۚ وَمِنَ الْجِبَالِ جُدَدٌ بِيضٌ وَحُمْرٌ مُّخْتَلِفٌ أَلْوَانُهَا
وَغَرَابِيبُ سُودٌ ﴿٢٧﴾ وَمِنَ النَّاسِ وَالدَّوَابِّ وَالْأَنْعَامِ
مُخْتَلِفٌ أَلْوَانُهُ كَذَٰلِكَ ۗ إِنَّمَا يَخْشَى اللَّهَ مِنْ عِبَادِهِ الْعُلَمَاءُ ۗ
إِنَّ اللَّهَ عَزِيزٌ غَفُورٌ ﴿٢٨﴾

صدق الله العظيم

{سورة فاطر}

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ABA: Abscisic acid

AOAC: Association of official agricultural chemists

CCA: Canonical correspondence analysis

CP: Crude protein

EW: East west

FAO: Food agricultural organization

GA_3: Gibberellic acid

HPLC: High performance liquid chromatography

IAA: Indole acetic acid

LSD: Least significant difference

NNW: North north west

SSE: South south east

TSS: Total soluble salts

TWINSPAN: Two way indicator species analysis

Abstract

Abu-Taha, Maged Mohammed. Habitat and species diversity in some Wadis in Sinai Peninsula. Unpublished Master of Science dissertation, Ain Shams University, 2010.

This study is intended to evaluate the effect of edaphic factors on species diversity and distribution of vegetation in Wadi El-Fath and Wadi Nukhul of Sinai Peninsula. Selection of stands was depending upon the change in the vegetation along the two Wadis. 68 species representing 23 families were recorded in the study area. Chamaephytes were the dominant life form in the two studied Wadis. Chorology of the two Wadis showed the dominance of the monoregional Saharo-Arabian chorotype. The application of TWINSPAN has led to the recognition of eight vegetational groups. The first four representing Wadi Nukhul, while the others representing Wadi El-Fath. CCA analysis indicated that the vegetational groups of Wadi Nukhul are affected by soil chemical properties, whereas physical properties affected the vegetational group of Wadi El-Fath. Soil texture and moisture content were the most important edaphic factors affecting the distribution of plant species in the two studied Wadis. Biodiversity indices revealed that Wadi El-Fath was more diverse than Wadi Nukhul; the highest species richness was found at the hills habitat in Wadi El-Fath (22.0), while the lowest mean species richness of 1.0±0.7 was recorded in the bounding sides of Wadi Nukhul. Four xerophytes were selected two succulent (*Haloxylon salicornicum* and *Zygophyllum coccineum*) and two non-succulent (true) xerophytes

(*Acacia tortilis* subsp. *raddiana* and *Retama raetam*) to study their ecophysiological adaptive responses to some possible changes in the physical and chemical properties of the soil in the two studied Wadis during winter and summer seasons. The studied xerophytes tend to accumulate higher values of carbohydrates, proteins, proline and minerals during winter. Such accumulation may be related to more favourable conditions for carrying out metabolic processes to withstand xeric conditions during summer. Although the studied plants belong to one ecological group; xerophytes, there were wide differences in their metabolic activities, indicating the wide range of adjustment mechanisms which would be regulated by the action of the seasonal variations in the endogenous phytohormones; auxins, gibberellins and abscisic acid. The accumulation of electrolytes and organic intermediates together with the increase of succulence seem to be essential adaptive responses in the adjustment of succulent xerophytes towards increased drought stress. Moreover, true xerophytes seem to depend largely on the accumulation of organic intermediates for the establishment of their osmotic potential rather than electrolytes.

***Key Words*:** Diversity, vegetation, TWINSPAN, CCA, Wadi, El-Fath, Nukhul, xerophytes and Sinai Peninsula.

Introduction

Vegetation has been widely used to describe habitats, water quality and make predictions about the presence and composition of the surrounding communities (Appelgren and Mattila, 2005). In Egypt, desert vegetation is the most important and a characteristic type of natural plant life. It covers vast area and is formed mainly of xerophytic shrubs and sub-shrubs (Abd El-Ghani and Amer, 2003). Annual plants represent 50-60% of the desert vegetation during the rainy season (Kassas, 1966).

Change in the existent components of a natural ecosystem, especially plants and soil, leads to gradual variations in the shape, composition and structure of communities. Therefore, studying the classification and the inter-relation between the different plant communities in response to the environmental factors are demanded (Jafari *et al*., 2003).

According to Weaver and Clements (1983) and Zahran (1989) plant life in xeric habitats can either economize the use of water or else have the capacity of drought evading, drought enduring and drought resisting. Habitats of xerophytes include a variety of landforms: rocky plateau, desert Wadis, desert mountains, gravel desert and desert plains (Zahran, 1989).

Knowledge concerning the physiological, biochemical and anatomical mechanisms used by plants to accommodate high salinity or drought should help plant breeders and cell biologists in their efforts to select plants having good tolerance to such environmental stresses and

to assess strategies that might be used today or in future to produce tolerant crop varieties (Morsy, 1996).

Xerophytes and halophytes naturally growing in the Egyptian deserts may play an important role for the welfare of the Egyptians. Apart from being drought and/or salinity tolerant plants, all have certain agro-industrial potentialities. These plants were in fact, the promising renewable natural resources that could supply the country with raw materials for different industries. Conservation and sustainable utilization of these plants should be on a scientific basis (Shawky, 2010).

Aim of the present work

The aim of the present work was to analyze the vegetation in Wadis El-Fath and Nukhul in Sinai Peninsula. The study also assesses the correlation between the environmental factors and some of vegetation variables in attempt to determine the distribution patterns of species and communities along the study area. Four xeric plants distributed in the two studied Wadis were chosen to study their ecophysiological adaptive responses to some possible changes in the physical and chemical properties of the soil. Seasonal changes in plant succulence, ash content, mineral composition, photosynthetic pigments, total nitrogen, protein, proline, carbohydrates and growth regulators were also investigated and discussed in relation to their habitat conditions.