

Synanthropic Vegetation and Plant Species Diversity in the Urban Environment of Some New Cities, Egypt

A Thesis

Submitted for the Degree of Doctor of Philosophy (Ph.D)

In Botany (Plant Ecology)

By Hamdia Tourky Mahmoud Ahmed

Botany Department Faculty of Science Cairo University

2009/2010



تركيب الكساء الخضري والتنوع النباتي في بعض المدن الجديده – مصر

رسالة مقدمة من حمدية تركى محمود أحمد للحصول على درجة دكتوراه الفلسفة في العلوم نبات (بيئه نباتيه)

قسم النبات كلية العلوم جامعة القاهره ٢٠١٠/٢٠٠٩

Approval Sheet

TITLE OF THE Ph.D. THESIS (PLANT ECOLOGY)

Synanthropic Vegetation and Plant Species Diversity in the Urban Environment of Some New Cities, Egypt

Submitted to the BOTANY DEPARTMENT, FACULTY OF SCIENCE

CAIRO UNIVERSITY

By

Hamdia Tourky Mahmoud Ahmed

The Supervision Committee:

Prof. Dr. Monier Mohamed Abd El Ghani

Botany Department, Faculty of Science, Cairo University

Prof. Dr. Reinhard Bornkamm

Institute of Ecology and Biology, Technical University in Berlin, Germany

Prof. Dr. Nadia A. El-Sawaf

Botany Department, Faculty of Science, Cairo University

Prof. Dr. Maimona A. Kord

Head of Botany Department Faculty of Science, Cairo University

THIS THESIS HAS NOT PREVIOUSLY BEEN SUBMITTED TO THIS OR TO ANY OTHER UNIVERSITY

Hamdia Tourky Mahmoud Ahmed

Acknowledgements

At first, I would like to thank **ALLAH** that allowed me to achieve this work, without his bless any great effort is invaluable.

I am grateful to **Prof. Dr. Monier Abd El Ghani**, Botany Department, Faculty of Science, Cairo University for suggesting the pint and keen supervision, to whom I will be forever grateful, for his generous help and guidance, and for the support he gave me through difficult times. Most important of all I respect him for his honesty, always welcoming attitude for discussion, and providing excellent guidance in research.

I would like to extend my deepest gratitude and thanks to **Prof. Dr. Reinhard Bornkamm**, Institute of Ecology and Biology, Technical University Berlin (Germany), who accompanied me in some field trips, guided, stimulated, and illuminating discussions.

Thanks are also extended to **Prof. Dr. Nadia A. El-Sawaf**, Botany Department, Faculty of Science, Cairo University for supervision, guidance in lab, and continuous encouragement throughout all stages of this work.

Special thanks to all my colleagues and friends in the Botany Department, Faculty of Science, Cairo University who supported me through all my practical and theoretical study.

DEDICATION

To

My Husband

For his Patience, Support and Encouragement

CONTENTS

Contents	Page
Introduction	1
Review of Literature	6
The Study Area 1. 6 th October city 2. El-Sadat city 3. 3Burg El-Arab city 4. 10 th Ramadan city	12
Materials and Methods 1. Vegetation sampling procedures 2. Soil sampling and analysis 3. Data analysis: Multivariate analysis 4. Species diversity	33
Results	
I. Plant species distribution and soil characteristics in the urban environments of four new cities in Egypt	53
II. Vegetation-environment relationships of urban habitats in four new cities in Egypt	112
Discussion	192
Summary	208
References	215
Appendices	228
Arabic summary	

LIST OF TABLES

Tables	Page
Table (1). Climatic means (2000-2006) for El-Badrasheen Meteorological Station (the nearest station to the 6 th October City)	16
Table (2). Climatic means (2000-2006) for Minoufia Meteorological Station (the nearest station to El-Sadat City)	20
Table (3). Climatic means (2003-2006) for El-Nozha Meteorological Station (the nearest station to Burg El-Arab City).	25
Table (4). Climatic means (2000-2006) for Abu Kabeer meteorological station (the nearest station to the 10 th of Ramadan City).	30
Table (5): Synoptic table of the indicator and preferential species of the four TWINSPAN groups (A - D) with their presence values (p%) in the 6^{th} October city.	59
Table (6): Mean values± standard deviations and ANOVA F values of the soil variables, species richness (SR) and Shannon's index (H') in the stands representing the four vegetation groups obtained by TWINSPAN in the 6 th October city.	61
Table(7): Summary of Pearson's correlations between soil variables, species richness (SR) and Shannon's index (H') in $6^{\frac{th}{2}}$ October city.	62
Table (8): The results of ordination for the four CCA axes, Inter–set correlation of the soil variables, together with eigenvalues and species–environment correlation in the 6^{th} October city.	67
Table (9): Synoptic table of the indicator and preferential species of the four TWINSPAN groups (A-D) with their presence values (P%) in El-Sadat city .	73
Table (10): Mean values± standard deviation and ANOVA F values of soil variables, species richness (SR) and Shannon's index (H') in the stands representing the four groups (A-D) obtained by TWINSPAN in El-Sadat city .	75
Table (11): Summary of Pearson's correlations between the soil variables to each other, species richness (SR) and Shannon's index in El-Sadat city.	76
Table (12): The results of ordination for the four CCA axes, Inter–set correlation of the soil variables, together with eigenvalues and species–environment correlation in El-Sadat city .	81
Table (13): Synoptic table of the indicator and preferential species of the for TWINSPAN groups (A - G) with their presence values (%) in Burg El-Arab city .	88
Table (14): Mean values± standard deviation and ANOVA F values of soil variables, species richness (SR) and Shannon's index (H') in the stands representing the seven groups obtained by TWINSPAN in Burg El-Arab city .	90
Table (15): Summary of Pearson's correlations between the soil variables, species richness (SR) and Shannon's index in Burg El-Arab city	91