



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم



شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



MONA MAGHRABY



شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



MONA MAGHRABY

BIODIVERSITY AND NATURAL CONTROL OF MITES ASSOCIATED WITH MEDICINAL PLANTS IN ORGANIC FARMING SYSTEMS

By

ISLAM MOHAMMAD SOLIMAN ZIDAN

B.Sc. Agric. Sci. (Agricultural Pests), Fac. Agric., Cairo Univ., 2007

M.Sc. Agric. Sci. (Agricultural Zoology), Fac. Agric., Cairo Univ., 2014

THESIS

**Submitted in Partial Fulfillment of the
Requirements for the Degree of**

DOCTOR OF PHILOSOPHY

In

**Agricultural Sciences
(Agricultural Zoology)**

**Department of Zoology and Agricultural Nematology
Faculty of Agriculture
Cairo University
EGYPT**

2021

APPROVAL SHEET

BIODIVERSITY AND NATURAL CONTROL OF MITES ASSOCIATED WITH MEDICINAL PLANTS IN ORGANIC FARMING SYSTEMS

**Ph.D. Thesis
In Agricultural Science (Agricultural Zoology)**

By

ISLAM MOHAMMAD SOLIMAN ZIDAN

**B.Sc. Agric. Sci. (Agricultural Pests), Fac. Agric., Cairo Univ., 2007
M.Sc. Agric. Sci. (Agricultural Zoology), Fac. Agric., Cairo Univ., 2014**

APPROVAL COMMITTEE

Dr. AWAD ABD ALLAH FARAHAT AL-BAHRAWY
Professor of Acarology, Department of Agricultural Zoology, Suez Canal University

Dr. SALLY FAROUK ALLAM
Professor of Acarology, Fac. Agric., Cairo University.

Dr. MOHAMED SAMY NAWAR
Emeritus Professor of Acarology, Fac. Agric., Cairo University.

Dr. MORAD FAHMY HASSAN
Emeritus Professor of Acarology, Fac. Agric., Cairo University.

Date: / /2021

SUPERVISION SHEET

**BIODIVERSITY AND NATURAL CONTROL OF
MITES ASSOCIATED WITH MEDICINAL
PLANTS IN ORGANIC FARMING SYSTEMS**

**Ph.D. Thesis
In Agricultural Science (Agricultural Zoology)**

By

ISLAM MOHAMMAD SOLIMAN ZIDAN
B.Sc. Agric. Sci. (Agricultural Pests), Fac. Agric., Cairo Univ., 2007
M.Sc. Agric. Sci. (Agricultural Zoology), Fac. Agric., Cairo Univ., 2014

SUPERVISION COMMITTEE

Dr. MORAD FAHMY HASSAN
Emeritus Professor of Acarology, Fac. Agric., Cairo University

Dr. MOHAMMED SAMY NAWAR
Emeritus Professor of Acarology, Fac. Agric., Cairo University

Dr. GOMAA MOHAMED ABOU-ELELLA
Researcher Professor of Acarology, NRC, Giza

Name of Candidate: Islam Mohammad Soliman Zidan

Degree: Ph.D.

Title of Thesis: Biodiversity and natural control of mites associated with medicinal plants in organic farming systems

Supervisors: Dr. Morad Fahmy Hassan

Dr. Mohammed Samy Nawar

Dr. Gomaa Mohamed Abou-Elella

Department: Agricultural Zoology and Nematology

Branch: Acarology

Approval: 24/6/2021

ABSTRACT

The current study was aimed to; 1) the diversity of mites associated with medicinal plants in organic farms, 2) investigate population dynamics of the most important pests of medicinal plants in some organic farms, 3) study the nutritional contents and morphological characters of targeted plants, 4) design a control application using indigenous predatory mite species located in organic habitats, 5) study the effect of fertilization of organic farming systems on the level of injury, and 6) to study the interaction of treatments to recommend the best protocol of IPM in an organic system. Samples of medicinal plants were collected from three certified organic farms by the ECOA, i) Shampolia farm, Ibshway, Fayoum Governorate (GPS 29°21'07.4"N 30°44'17.8"E), ii) SEKEM farm, Belbis, Ash Sharqia Governorate (GPS 30°22'56.1"N 31°39'17.4"E), and iii) Egyptian Hydrofarms (an organic hydroponic company), Cairo-Alex Highway Giza Governorate, (GPS 30°09'07.0"N 30°50'59.5"E). Biodiversity resulted in mite and insect species diversity indices, there were some mite species which have dominance by inhabiting weed plants. Also, the distribution, species richness, similarity, and rarity of arthropod species detected and calculated. Two organic locations selected to perform pest population dynamics field experiments; i) Om Sabir, El Beheira Governorate (30°29'50.6"N 30°46'18.8"E), and ii) Kom Oshim, Fayoum Governorate (29°34'40.9"N 30°55'38.3"E), during two seasons 2016 and 2017. Through the study, the curves of the Two-spotted spider mite (TSSM), white fly and onion thrips were studied, as well as indicators of distribution and diversity of these pests. Organic medicinal plants have also been analyzed in the study to determine their nutrient content that may affect the biology of the TSSM, which has been demonstrated by the biological study and life table parameters. Biological and demographic parameters have been studied for the three most important phytoseiid predators used commercially in IPM applications; *Phytoseiulus persimilis*, *Amblyseius swirskii* and *Cydnocius negevi*, for the purpose of evaluating their effectiveness under laboratory conditions. A natural control program was designed from several elements; including three phytoseiid species and two natural compounds; Bio-Magic and Egyxide, which recommended in organic protocols. Results showed high efficiency of *P. persimilis* to reduce the TSSM populations, as well as the efficiency of predators *A. swirskii* and *C. negevi* in reducing the white fly and thrips populations to levels below the EIL and ETL. While the results of using Egyxide and/or Bio-Magic compounds have shown instability that may be useful in reducing the pest populations in case of severe injury, the author suggest that the control program should be applied as an integrated group and not as individual units, because of its impact on reducing the number of pests, preserving natural biodiversity in the organic agricultural system, and finally obtaining a completely healthy food product.

Key words: Biodiversity, Organic agriculture, Medicinal plants, Population dynamics, Life table parameters, IPM, Predatory mites, TSSM, Whitefly, Thrips.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
REVIEW OF LITERATURE	5
1. Organic Farming	5
2. Biodiversity	5
a. Biodiversity: What is it, and why is it important?	5
b. Biodiversity and IPM	9
c. Biodiversity of arthropods in medicinal plants.....	10
d. A. The Two-Spotted Spider Mite (TSSM)	15
3. The impact of plant variety on the biology, developmental duration, fecundity, and life table parameters	16
4. Population dynamics and IPM of pest species	19
MATERIALS AND METHODS	22
1. Biodiversity	22
a. Locations.....	22
b. Sampling.....	24
c. Taxonomical confirmation.....	25
d. Biodiversity experimental procedure.....	25
e. Biodiversity statistical analysis.....	25
2. Plant analysis	28
Plant nutritional content analysis.....	28
a. Plant sources.....	28
b. Nutrient content analysis.....	29
c. Experimental statistical analysis.....	29
d. Plant morphological characters.....	30
3. Life table parameters of mites	30
a. Two-spotted spider mite TSSM.....	30
(1). Mite colonies.....	30
(2). Experimental design.....	30
b. Predatory mites.....	31
Mites sources and colonies.....	31
(1). <i>Phytoseiulus persimilis</i> Athias-Henriot.....	31
(2). <i>Amblyseius swirskii</i> (Athias-Henriot)	31
(3). <i>Cydnoseius negevi</i> Swirski and Amitai.....	31
c. Experimental procedure.....	32

d. Statistical Analysis.....	33
4. Control of pests infesting organic medicinal plants.....	34
a. Field experimental locations.....	34
b. Plant sources.....	35
c. Planting.....	35
d. Population dynamics of organic medicinal plant pests.....	37
e. Control strategies of organic medicinal plant pests.....	37
(1). Bio Agents.....	37
(2). Plant extracts.....	38
(3). Pest pathogens.....	38
f. Control experimental procedure.....	38
g. Reduction percentage.....	39
RESULTS.....	40
1. Biodiversity of mites associated with medicinal plants.....	40
a. Shampoliah farm, Ibshway, Fayoum Governorate.....	40
b. SEKEM farm, Belbis, Al Sharqia Governorate.....	53
c. Egyptian Hydrofarms, Cairo-Alexandria Highway Giza Governorate.....	72
d. Similarity index between three experimental locations.....	81
2. Plant analysis.....	82
Plant nutritional content analysis.....	82
3. Plant morphological characters.....	88
4. Effect of plant source on biology and life table parameters of mites associated with organic medicinal plants.....	97
a. Effect of plant source on biology and life table parameters of the Two-Spotted Spider Mite.....	97
(1). Post-embryonic Development and female longevity of <i>T. urticae</i>	97
(2). Fecundity and sex ratio of <i>T. urticae</i>	98
(3). Life table parameters of <i>T. urticae</i>	98
b. Effect of plant source on biology and life table parameters of the predatory mite species associated with medicinal plants.....	103

