بسم الله الرحمن الرحيم

شبكة المعلومـــــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـــسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

STUDIES ON THE NATURAL ENEMIES OF SCALE INSECTS INFESTING SOME FRUIT TREES

BY

GAMAL ABDEL–NASSER MORSI

B. Sc. Agric. (Economic Entomology & Pesticides)
Cairo University
M. Sc. (Economic Entomology – Biological Control)
Fac. of Agric., El-Fayoum, Cairo University

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

DOCTOR OF PHILOSOPHY

In
Economic Entomology (Biological Control)
Department of Plant Protection,
Faculty of Agriculture, Moshtohor
Benha Branch
Zagazig University

1999

APPROVAL SHEET

Title : Studies on the natural enemies of scale insects infesting some fruit trees.

Degree: Ph.D. in Economic Entomology (Biological Control)

Name: Gamal Abdel-Nasser Morsi

Department: Plant Protection

This thesis for Ph.D. degree has been approved by:

M. M. Assaw...

F. F. Shelak

...

Adel Hafez

Committee in charge

Date: 11 / 8 /**1999**

The co-operation of Mr. Emad Pebars, Class. Res. Dept., Plant Prot. Res. Inst. for identifying such predacious insects is acknowledged.

Special appreciation are also due to all staff members of Plant Protection and Maize Departments at Sids Agric. Res. Station and to all others who offered their help and co-operation.

Finally, the warmest thanks and grateful are expressed to my parents, wife, son and daughters for enthusiastic help and support during this work.

Contents

	Page
-INTRODUCTION	1
-REVIEW OF LITERATURE	3
I. Survey of natural enemies of scale insects in the world	3
II. Population abundance and number of generations of some scale insects	28
II.1. The California red scale, *Aonidiella aurantii*	28
II.2. The Oriental yellow scale, *Aonidiella orientalis*	31
II.3. The Florida red scale, *Chrysomphalus aonidum*	32
III. The role of entomophagous insects in suppressing the scale insects' population	36
IV. Biological studies	41
IV. 1. *Aspidiotiphagus citrinus*	41
IV. 2. *Habrolepis pascuorum*	44
-MATERIALS AND METHODS	45
I. Survey of natural enemies of different scale insects	45
II. Population fluctuations of the scale insects	46
III. Rate of parasitism	47
IV. Biology of *A. citrinus* and *H. pascuorum.*	48
-RESULTS AND DISCUSSION	55
I .Survey of entomophagous insects and predacious mites of certain scale insects in Beni–Suef Governorate	55
II. The seasonal abundance of certain scale insects	70
II. 1. The seasonal abundance of California red scale, *A. aurantii*	70
II. 2. The seasonal abundance of Oriental Yellow scale, *A. orientalis*	84
II. 3. The seasonal abundance of Florida red scale, *C. fiicus*	97
III. Role of parasitoids and other mortality factors on some scale insects	109

III. 1. Role of parasitoids on *A. aurantii* 109
III. 2. Role of parasitoids on *A. orientalis* 116
III. 3. Role of parasitoids on *C. ficus* 124
IV. Biological studies 132
IV. 1. *Aspidiotiphagus citrinus* 132
IV. 2. *Habrolepis pascuorum* 158
V. Hyperparasitism 186
- SUMMARY 194
- REFERENCES 208
- ARABIC SUMMARY .....

INTRODUCTION

infested fruits and small size of fruits together with lack of juice in case of heavy infestation.

Since the fluctuations of population density of the Oriental yellow scale and the role of natural enemies in regulating its abundance have not been studied up till now in Egypt, the present work was initiated with the aim of contributing some of the needed information in this respect.

The presented study was conducted throughout 3 successive years from mid-April 1995 up to the beginning of April 1998. The scope of the study included the following aspects:

1-Survey of the natural enemies, parasitoids and predators of certain scale insects under study.

2-The seasonal changes in the population dynamics of *Aonidiella aurantii* (Mask.), *Aonidiella orientalis* (Newst.) and *Chrysomphalus aonidum* L. in Beni-Suef Governorate.

3-Evaluation of the rate of natural mortality of the three above mentioned scale insects that caused by parasitoids.

4-Biological studies for two hymenopterous parasitoids which were recorded and reared from the Oriental yellow scale insect for the first time in Egypt viz., *Aspidiotiphagus citrinus* (Craw.) and *Habrolepis pascuorum* Mercet.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Reviewed researches in the available literature may be classified in the following:

I. SURVEY OF NATURAL ENEMIES OF SCALE INSECTS IN THE WORLD:

The available literature concerning the natural enemies of the scale insect species under study [*Aonidiella aurantii* (Maskell), *A.orientalis* (Newstead), *Aulacaspis tubercularis* (Newstead), *Ceroplastis rusci* (Linnaeus), *Chrysomphalus aonidum* L., *Lecanodiaspis africana* Newstead, *Lepidosaphes pallida* Maskell, *Leucaspis riccae* Targioni Tozzetti and *Parlatoria blanchardii* (Targioni Tozzetti)] are presented in Tables (1, 2 and 3). Those could be classified as follows:

a- Parasitoids.

Insecta; 102 species belonging to 6 families in two orders.

b- Predators.

1- Insecta, 83 species belonging to 10 families in five orders.

2- Arachnida; 18 species belonging to 7 families in two orders.

c- Pathogens.

Schezomycetes; 19 species belonging to 8 families in six orders.

Table (1): List of recorded parasitoids on the studied scale insects:

Order	Family	Species	Host	Locality	Author (s)
Hymenoptera	Aphelinidae	*Ablerus guadrii*	*A. aurantii*	Israel	Ofek et al. (97)
			A. orientalis	Israel	Ofek et al. (97)
		Aphelinus chrysomphali Mercet	*C. ficus*	Algeria	Balachowsky (28)
				China	Silvistri (29)
				Formosa	Matsuda (29)
				Egypt	Priesner (31)
		Aphelinus sp.	*C. ficus*	Japan	Ishii (26)
		Aphytis africanus Quednau	*A. aurantii*	S. Africa	Quednau (64)
				Israel	De Bach et al. (78)
				S. Africa	Prinsloo (84)
					Samways (89)
			A. orientalis	Saudi-Arabia	De Bach (79)
			C. ficus	S. Africa	Quednau (64)
					Cilliers (71)
					Prinsloo (84)
		A. aonidiae (Merc.)	*A. aurantii*	Israel	Rosen (66)
			C. ficus	Israel	Rosen (66)
		A. chrysomphali (Mercet)	*A. aurantii*	Egypt	Priesner& Hosny (40)
				S. Wales	Friend (45)
				S. Africa	Quednau (64)
				Israel	Rosen (66)
				Australia	Furness et al. (83)
				S. Africa	Prinsloo (84)
				Egypt	Hafez (88)
					Hamed&Hassanien(91)
					Osman (96)