

ABSTRACT

Guava trees is an important fruit crop in Egypt. It is distributed in most regions of Egypt. Guava trees (*Psidium guajava* L.) are subjected to infestation with many species of insects among which, *Ferrisia virgata* (Cockerell) (Pseudococcidae:Homoptera), *Hemiberlesia lataniae* (Signoret) and *Insulaspis tapleyi* (Williams) (Diaspididae:Homoptera) are the most common. Survey of the insects associated with Guava trees at twelve Governorates was conducted. These species belong to four families; Coccidae, Diaspididae, Margarodidae and Pseudococcidae one of these species *F. virgata* was recorded for the first time in Egypt.

Ecological investigations were conducted for two years (November, 1997-October, 1999) at Marutyia, Giza Governorate in Egypt. The obtained results can be summarized as follows:

- 1-*Ferrisia virgata* recorded two peaks in the two years study while its parasite *Blepyrus insularis* (Cameron) had four peaks during the study period.
- 2-*Hemiberlesia lataniae* recorded three peaks in both years while its parasite *Habrolepis aspidioti* Compere & Anneck had four peaks during the period of study.
- 3-*Insulaspis tapleyi* recorded three peaks in both years while the parasite *Aphytis* sp. had three peaks in the first year and four peaks in the second year.

Results indicated that all *F. virgata*, *H. lataniae* and *I. tapleyi* didn't prefer any of the five directions of the trees. Results indicated that there were no significant difference among the number of insects counted on the upper and lower surfaces on *F. virgata*. However, *H. lataniae* and *I. tapleyi* significantly preferred the upper surface of leaves. The effect of some climatic factors namely, Temperature, relative humidity, photo period, dew point and wind speed on the abundance of the scale insects and their parasites were also investigated. Results were highly variable and details were shown results and depends on the insect species.

Studies on the efficiency of three compounds on population of *Ferrisia virgata*, *Hemiberlesia lataniae* and *Insulaspis tapleyi* infesting Guava trees in Giza Governorate were carried out. The compounds used included Insect Growth Regulators (IGR), mineral oil and insecticide. Obtained results from conducted experiment revealed that all the tested treatments could be used successfully to protect Guava trees from the attack by *F. virgata*, *H. lataniae* and *I. tapleyi*. Admiral, KZ oil and Admiral mixed with KZ oil (used as spreader) had a strong effect on *F. virgata*, *H. lataniae* and *I. tapleyi*. And they could be recommended to control. To avoid any possible environmental pollution, an integrated pestmanagement "IPM" approach should be applied.

Key words: Homoptera – Coccoidea - Diaspididae - *Hemiberlesia lataniae* - *Insulaspis tapleyi* - Pseudococcidae - *Ferrisia virgata* - Ecology – parasites-insecticides

المستخلص

أشجار الجوافة من المحاصيل الهامة في مصر حيث تنتشر في مناطق كثيرة في مصر. وتعرض أشجار الجوافة للأصابة بالعديد من الآفات ومنها:
Ferrisia virgata (Cockerell) Family: Pseudococcidae
Hemiberlesia lataniae (Signoret) Family: Diaspididae
Insulaspis tapleyi (Williams) Family: Diaspididae
وهم من رتبة متشابهة الأجنحة.

تم حصر الحشرات القشرية والبق الدقيقي المتواجدة على أشجار الجوافة في اثني عشر محافظة حيث وجد ٢١ نوع كانت تتبع أربع عائلات هم : Coccidae Margarodidae and Pseudococcidae, Diaspididae
ووجد من خلال الحصر أن نوع واحد تم تسجيله علي الجوافة في مصر لأول مرة وهي حشرة *Ferrisia virgata* (Cockerell)

أجريت الدراسة الأيكولوجية بمنطقة المريوطية بمحافظة الجيزة خلال سنتين متتالين (من نوفمبر ١٩٩٧ الي أكتوبر ١٩٩٩) وأظهرت النتائج:
* وجود جيلين لحشرة *F. virgata* بينما سجل أربعة أجيال للطفيل المصاحب للحشرة *Blepyrus insularis* (Cameron) وذلك في كل سنة من سنوات الدراسة.
* حشرة *H. lataniae*: تبين أن لها ثلاثة أجيال بينما كان للطفيل المصاحب لها *Habrolepis aspidioti* Compere & Anneck أربعة أجيال وذلك في كل سنة من سنوات الدراسة.
* حشرة *I. tapleyi*: تبين أن للحشرة ثلاثة أجيال في كل سنة من سنوات الدراسة بينما كان للطفيل المصاحب *Aphytis* sp لها ثلاثة أجيال في السنة الأولى وأربعة أجيال في السنة الثانية.

كما أظهرت النتائج أنه لا يوجد فرق معنوي في الأصابة بين الاتجاهات الخمسة وذلك بالنسبة للحشرات الثلاثة. وكذلك عدم وجود فرق معنوي في الأصابة بين السطح العلوي والسطح السفلي وذلك بالنسبة لحشرة *F. virgata* ولكن كان هناك فرق معنوي في الأصابة بين السطح العلوي والسفلي وذلك بالنسبة لحشرة *H. lataniae* و *I. tapleyi*.

كما تم دراسة مدى تأثير كل حشرة ببعض العوامل الجوية والبيئية المحيطة تحت الدراسة وهي درجة الحرارة والرطوبة والضوء ونقطة الندى والرياح وكذلك دراسة هذه العوامل علي الطفيليات المصاحبة للحشرات في تلك الفترة وكان تأثير كل حشرة بالعوامل الجوية مختلف فيما بينهم.

كما تم دراسة تأثير بعض المركبات الأمانة بينيا مثل الزيوت المعدنية ومنظمات النمو بالاضافة الي مخلوط منظم النمو مع الزيت المعدني كمادة ناشرة وقد أجريت هذه التجربة في ديسمبر ٢٠٠٠ وقد أعطت هذه المواد كفاءة ابادية عالية علي خفض أعداد الحشرات حيث أنها لا تؤدي الي تلوث البيئة وذلك بالمقارنة بالمبيدات الفسفورية.

CONTENTS

Contents	Page
1. INTRODUCTION.....	1
2. REVIEW OF LITERATURE.....	3
2.1.1.) Survey of scale insects and mealybugs associated with Guava trees in Egypt.....	3
2.1.2.) Survey of parasites and predators associated with <i>F.</i> <i>virgata</i> , <i>H. lataniae</i> and <i>I. tapleyi</i> in Egypt.....	6
2.1.3.) Survey of scale insects and mealybugs infesting Guava trees in the world.....	7
2.2.) Distribution of some scale insects and mealybugs <i>F. virgata</i> , <i>H. lataniae</i> and <i>I. tapleyi</i>	7
2.2.1.) <i>Ferrisia virgata</i> (Cockerell).....	7
2.2.2.) <i>Hemiberlesia lataniae</i> (Signoret).....	11
2.2.3.) <i>Insulaspis tapleyi</i> (Williams).....	13
2.3.) Parasites and predators attacking <i>F. virgata</i> and <i>H. lataniae</i>	15
2.3.1.) <i>Ferrisia virgata</i> (Cockerell).....	15
2.3.2.) <i>Hemiberlesia lataniae</i> (Signoret).....	16
2.4.) Chemical control of scale insects and mealybugs	19
3. MATERIALS AND METHODS.....	24
3.1.) Ecological studies	24
3.1.1.) Survey of scale insects and mealybugs on Guava trees in Egypt.....	24
3.1.1.1.) Insects sources.....	24
3.1.1.2.) Sample collection.....	24
3.1.1.3.) Sampling for the laboratory examination.....	24
3.1.2.) Population fluctuations of scale insects and mealybugs infesting Guava trees at Giza Governorate....	24
3.1.2.1.) Area of experiments	24
3.1.2.2.) Sampling method.....	25
3.1.2.3.) The associated natural enemies.....	25
3.1.2.4.) Statistical analysis.....	26

3.2.) Field evaluation of certain insecticides against <i>F.virgata</i> , <i>H.lataniae</i> and <i>I. tapleyi</i> on Guava trees.....	26
3.2.1.) Insecticides used.....	26
3.2.2.) Technique	27
3.2.3.) The tested treatment	27
3.2.4.) Experimental design.....	27
3.2.5.) Sampling.....	28
3.2.6.) Statistical analysis.....	28
 4. RESULTS AND DISCUSSION.....	 30
4.1.) Ecological studies.....	30
4.1.1.) Survey of scale insects and mealybugs attacking Guava trees in Egypt.....	30
4.1.2.) Population fluctuations of <i>Ferrisia virgata</i>	32
4.1.2.1.) The approximated numbers, duration and generation size of mealybug <i>Ferrisia virgata</i> under field conditions.....	32
4.1.2.1.1.) Number of field generations in the first year 1997-1998.....	32
4.1.2.1.2.) Number of field generations in the second year 1998- 1999.....	37
4.1.2.2.) The abundance of <i>Ferrisia virgata</i> in the five cardinal directions on the Guava trees.....	39
4.1.2.3.) Distribution of <i>Ferrisia virgata</i> on the two sides of Guava leaves.....	44
4.1.2.4.) Effect of some ecological factors on the seasonal abundance of <i>Ferrisia virgata</i>	47
4.1.2.5) Combined effect of ecological factors on the seasonal abundance of <i>Ferrisia virgata</i>	50
4.1.2.6) Fluctuations in the population density and generation duration of <i>Blepyrus insularis</i> under field conditions.....	51
4.1.2.6.1.) Number of field generations in the first year 1997-1998.....	53
4.1.2.6.2.) Number of field generations in the second year 1998-1999.....	53
4.1.2.7.) The rate of parasitism.....	54

4.1.2.8.)	Effect of some climatic factors on the seasonal abundance of <i>Blepyrus insularis</i>	54
4.1.2.9.)	Combined effect of climatic factors on the seasonal abundance of <i>Blepyrus insularis</i> attacking <i>F. virgata</i>	57
4.1.3.)	Population fluctuations of <i>Hemiberlesia lataniae</i>	59
4.1.3.1.)	The approximated numbers, duration and generation size of scale insect <i>Hemiberlesia lataniae</i> under field conditions.....	59
4.1.3.1.1.)	Number of field generations in the first year 1997-1998.....	59
4.1.3.1.2.)	Number of field generations in the second year 1998-1999.....	64
4.1.3.2.)	The abundance of <i>Hemiberlesia lataniae</i> insects in the five cardinal directions of the Guava trees.....	66
4.1.3.3.)	Distribution of <i>Hemiberlesia lataniae</i> on the two sides of Guava leaves.....	71
4.1.3.4.)	Effect of some ecological factors on the seasonal abundance of <i>Hemiberlesia lataniae</i>	74
4.1.3.5.)	Combined effect of the ecological factors on the seasonal abundance of <i>Hemiberlesia lataniae</i> insects.....	76
4.1.3.6.)	Fluctuations in the population density and generation duration of <i>Habrolepis aspidioti</i> under field conditions.....	78
4.1.3.6.1.)	Number of field generations in the first year 1997-1998.....	78
4.1.3.6.2.)	Number of field generations in the second year 1998-1999.....	80
4.1.3.7.)	The rate of parasitism.....	80
4.1.3.8.)	Effect of some climatic factors on the seasonal abundance of <i>Habrolepis aspidioti</i>	81
4.1.3.9.)	Combined effect of the climatic factors on the seasonal abundance of <i>Habrolepis aspidioti</i> attacking <i>Hemiberlesia lataniae</i>	84
4.1.4.)	Population fluctuations of <i>Insulaspis tapleyi</i>	86
4.1.4.1.)	The approximated numbers, duration and generation size of scale insects <i>Insulaspis tapleyi</i> under field conditions.....	86

4.1.4.1.1.) Number of field generations in the first year 1997-1998.....	86
4.1.4.1.2.) Number of field generations in the second year 1998-1999.....	91
4.1.4.2.) The abundance of <i>Insulaspis tapleyi</i> insects in the five cardinal directions on the Guava trees.....	93
4.1.4.3.) Distribution of <i>Insulaspis tapleyi</i> on the two sides of the Guava leaves	98
4.1.4.4.) Effect of some ecological factors on the seasonal abundance of <i>Insulaspis tapleyi</i>	101
4.1.4.5) Combined effect of the ecological factors on the seasonal abundance of <i>Insulaspis tapleyi</i>	103
4.1.4.6.) Fluctuations in the population density and generation duration of <i>Aphytis</i> sp. under field conditions.....	105
4.1.4.6.1.) Number of field generations in the first year 1997-1998.....	105
4.1.4.6.2.) Number of field generations in the second year 1998-1999.....	107
4.1.4.7.) The rate of parasitism.....	107
4.1.4.8) Effect of some climatic factors on the seasonal abundance of <i>Aphytis</i> sp.	108
4.1.4.9.) Combined effect of the climatic factors on the seasonal abundance of <i>Aphytis</i> sp. attacking <i>I. tapleyi</i>	110
4.2.) Field evaluation of certain insecticides against <i>F. virgata</i> , <i>H. lataniae</i> and <i>I. tapleyi</i> on Guava trees at Marutya, Giza Governorate.....	112
4.2.1.) Effect on <i>Ferrisia virgata</i>	112
4.2.2.) Effect on <i>Hemiberlesia lataniae</i>	114
4.2.3.) Effect on <i>Insulaspis tapleyi</i>	116
5. SUMMARY AND CONCLUSION.....	120
6. REFERENCES.....	126
7. APPENDICES.....	139
8. ARABIC SUMMARY	