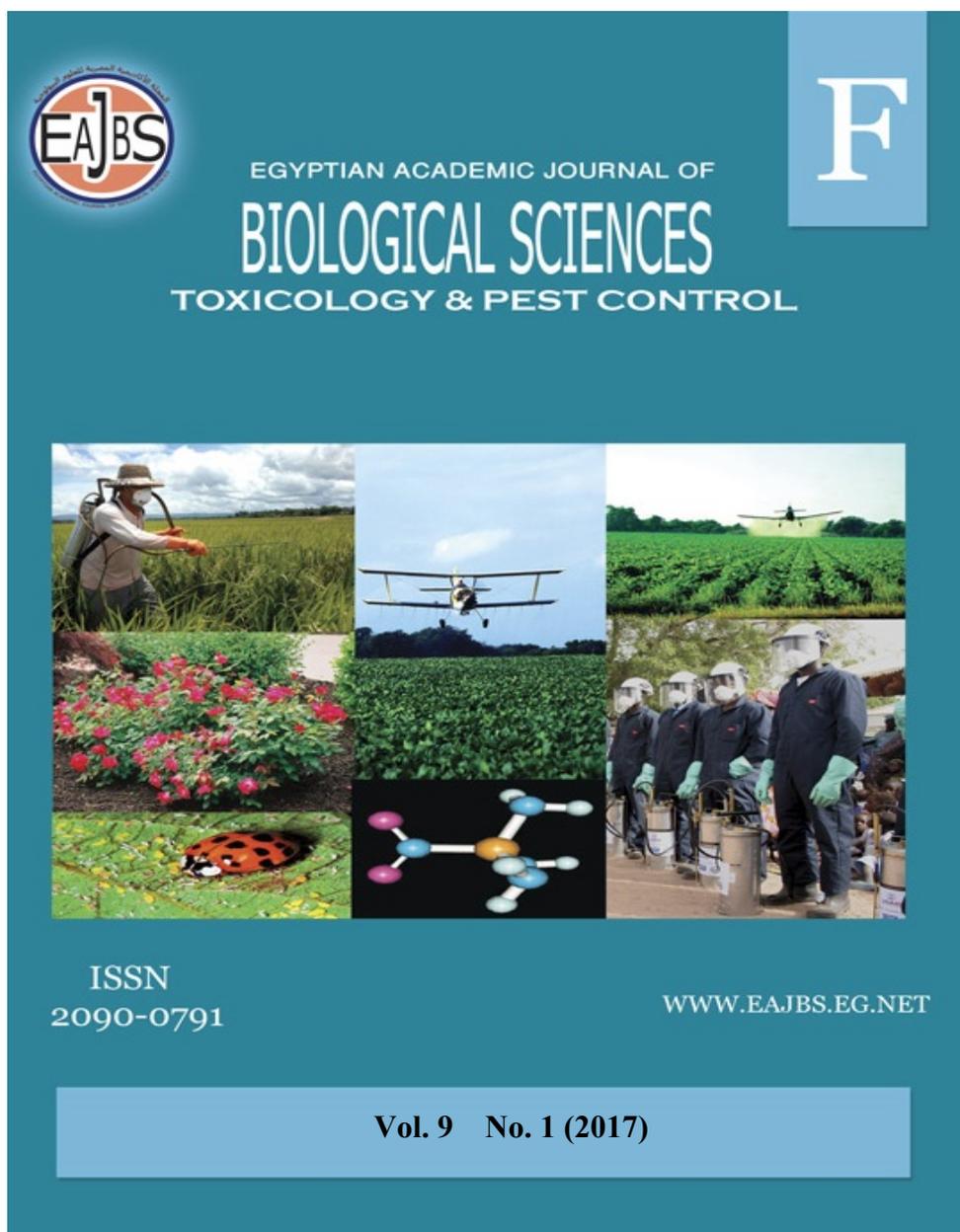


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## Population Fluctuations of *Hemiberlesia lataniae* (Signoret) and Survey of Its Natural Enemies in Qaliobiya Governorate.

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### ABSTRACT

The population fluctuation of the latania scale, *Hemiberlisis lataniae* (Signoret) was studied for two successive years from (early December, 2012 till mid November, 2014) on guava trees that was obligated to produce its yield in winter to avoid infestation by fruit fly and low price at Shebeen El-Qanater district, Qaliobiya Governorate. The obtained results revealed that *H. lataniae* occurred on guava tree all the year round and has three overlapping generations a year. The first generation lasted 120, days (autumn generation), the second generation lasted 90 days, (winter generation) and the third generation (spring generation). It lasted 90 days during the first year. Also the three generation of the second year of investigation were occurred in the same periods where the trees were vigor and full of plant juice (production of green shoots, flowering and fruiting periods). The relationship between the pest fluctuation and three climatic factors (minimum and maximum temperature & R.H. %) were studied where the simple correlation of the Max. and Min temperature were negative and significant but R.H. % gave negative and insignificant. These results is abnormal because the most effective factor is the leaf age in third degree. the combined effect was positive and significant. Also the natural enemies (predators and parasitoids) was surveyed and identified. The surveyed predators were five species of predaceous mites with high, moderate populations and *Chrysoperla carnea* (stephens), *Rodolia cardinalis* (mulsant) with low population. Also there were three different parasitoids associated with the scale insect, *H. lataniae*, *Aphytis* sp, *Comperiella bifasciata* Howard (primary parasitoids) and *Mariettja vensis* (Haward) (hyper parasitoid).

### INTRODUCTION

*H. lataniae* (Signoret) is one of the most serious pest attacking fruit and certain other ornamental trees in many areas of the world, including Egypt Danzig and Pellizzari, (1998). It is a polyphagous species that has been recorded hosts belonging to 280 genera in 80 plant families Davidson and Miller, (1990). In Egypt, it infests fig, guava. Pears, apple, grape vine and olive trees (El- Minshawy *et al.*, (1974) and Radwan, (2014). Guava is one of the most important and popular fruits in Egypt. The heavily infestation of guava trees by *H. lataniae* results in weakness of the tree and lost of yield.

The pest sucks the plant sap causing weakness of the tree and deformations by the action of the toxic saliva so the presence of it can be detected by abnormal coloring of some leaves, twigs and fruit, and pitting of the bark stems Daneel, (1998). *H. lataniae* can cause problems during the production and packing of the fruit. Despite its importance as pests, there were interactions between these insects and their host plants, also this armored scale insect cause histological alterations in fruits and branches of trees Hernandez, (2013). Sever infestation caused the drying out of the branches, dropping of leaves and cause dieback of twigs and branches Kosztarab, (1996). This work was conducted through the years, 2013-2014, with the aim of contributing some of needed information on the seasonal abundance of *H. lataniae* on guava trees and survey of its natural enemies.

#### MATERIALS AND METHODS

The examined locality was about two feddans at Shebein El-Qanater to demonstrate the population density of *H. lataniae* (Signoret) on a *Pisidium guava* during two successive years from (early December, 2012 till mid-November, 2014). The selected orchard for present investigation did not receive any chemical control at least two years before this study. The examined orchard and the all orchards at Shbeen el-Qanater area received the same agricultural practices where, the farmers remove all the green leaves of all trees in summer on early July (change the plant phenology) and stop irrigation and fertilization for one month after this month they start to add fertilizes and irrigate the orchards then the tree give green shoots, flowers finally give the fruit (yield) in late winter or spring. These agriculture practices were done to avoid the infestation by fruit flies and obtain high yield price.

#### Sampling for studies on the seasonal abundance of *H. lataniae*:

The sampling was conducted once every two weeks from 1/12/2012 to 15/11/2014. A sample of about 30 leaves divided in three replicates. The samples were put in polyethylene bags and transferred into laboratory for inspection with stereomicroscope; the insects on each sample were sorted into.

1- Alive unparasitized individuals, which were as following:

Nymphs, adult female and gravid females (ovipositing female). The total number of the alive individuals in each sample was taken as the population index.

2- Parasitized individuals.

The number of annual generations and their durations of *H. lataniae* were determined using the obtained data throughout the two successive years using the age-structure technique per sample over the year, El-Amir (2009) , throughout the two successive years of investigation.

Recording of meteorological factors minimum temperature, maximum temperature and relative humidity were obtained from the nearest meteorological station. The daily records of these factors were grouped into half monthly average to correspond with insect samples. To investigate the effect of the climatic factors simple correlation, regression and partial regression test were applied by the aid of SAS Institute 1988 to verify these influences.

#### Sampling for survey of natural enemies of *H. lataniae*:

Guava leaves were examined on different months in Qaliobiya Governorate. Samples of guava leaves infested with *H. lataniae* were collected. The specimens were confined in glass jar kept in laboratory for securing any emerging parasites or associated predators.

**RESULTS AND DISCUSSION**  
**Seasonal fluctuation of *Hemiberlesia lataniae* different stages and total population:**

Figs., (1&2) showed the half-monthly population fluctuations of *H. lataniae* total population and different stages,(nymph, adult female and ovipositing female) at Qaliobiya Governorate in (2012-2013) and (2013-2014).

**1- Seasonal fluctuations of *H. lataniae* total population.**

The total population of *H. lataniae* had two peaks per year recorded on early January and mid-April 2013 with 127 and 86 insects/leaf during the first year of study. During the second year of study, the two peaks recorded on early January and early May 2014 with 69 and 93 insects/leaf.

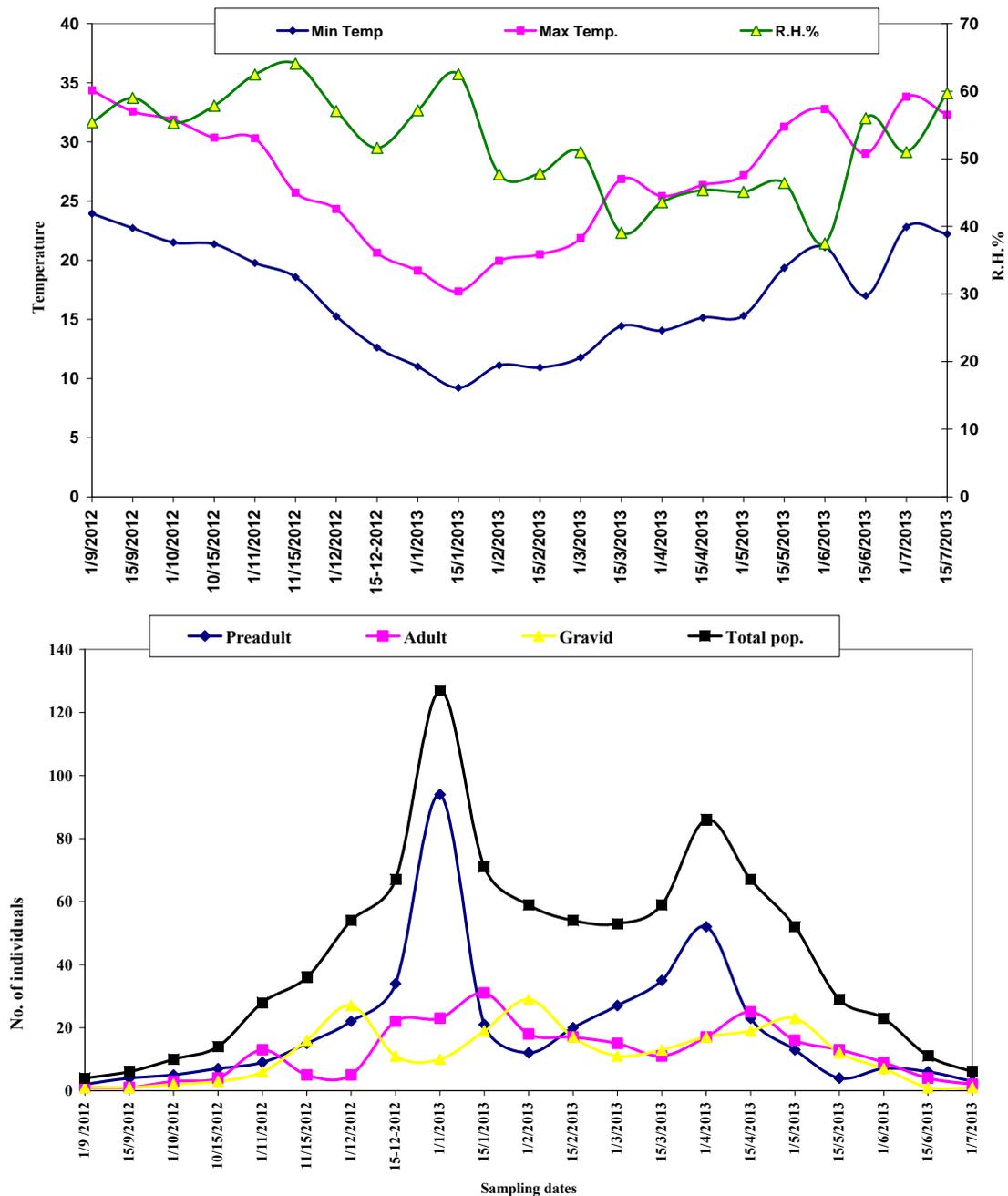


Fig: (1) Seasonal fluctuations of *H. lataniae* total population and different stages in Qaliobiya Governorate during 2012-2013

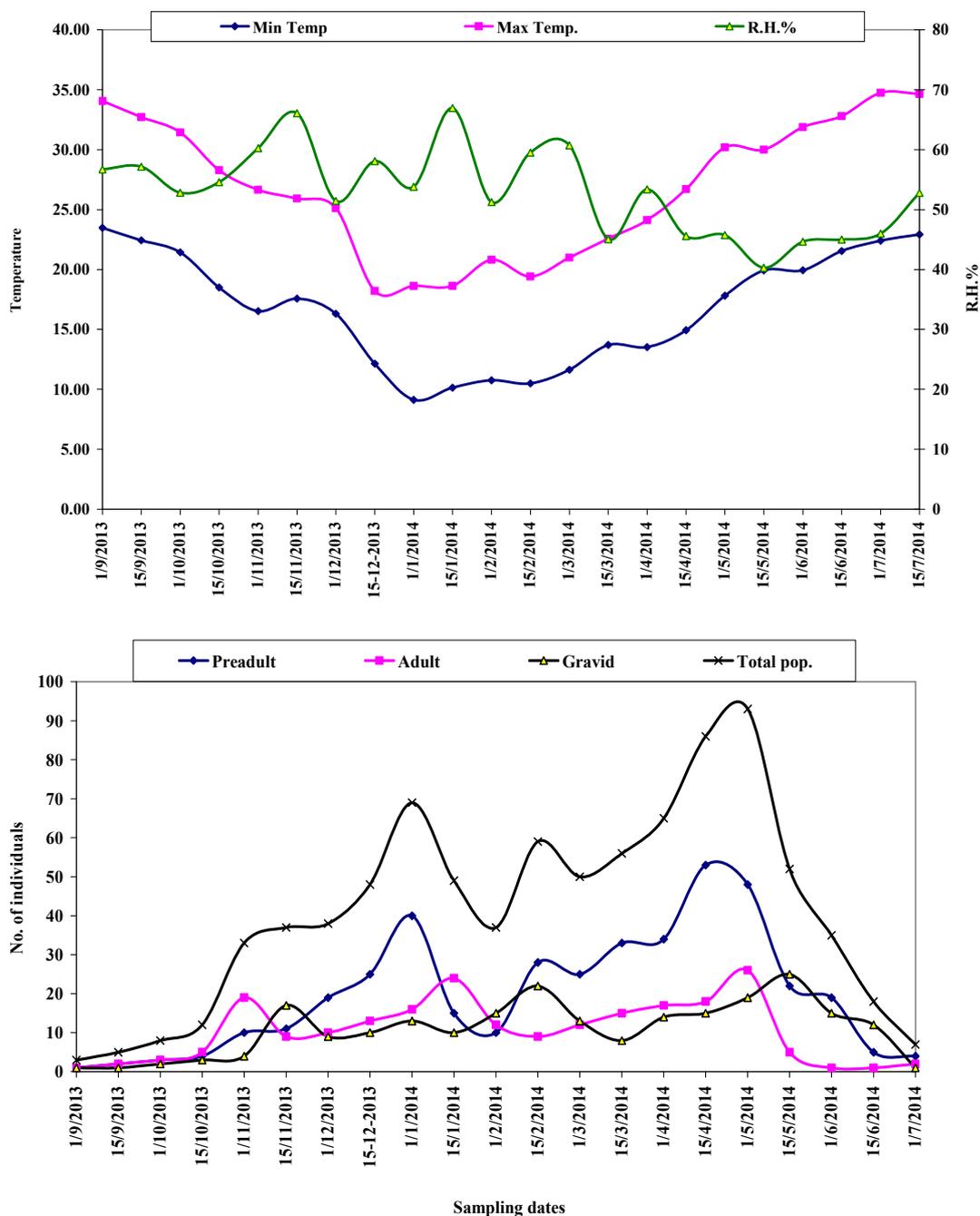


Fig: (2) Seasonal fluctuations of *H. lataniae* total population and different stages in Qaliobiya Governorate during 2013-2014

**2- Seasonal fluctuations of *H. lataniae* different stages.** Data illustrated in Fig., (1), and Fig., (2) that:

**Seasonal fluctuations of *H. lataniae* nymphal stage.** Nymphs had two clearly peaks per year, the first was recorded in 1<sup>st</sup> January, 2013 with 94 nymphs/leaf and the second peak recorded in 1<sup>st</sup> April, 2013 with 52

nymphs/leaf. During the second year of study, the nymphal stage of *H. lataniae* had two peaks, the first one recorded in 1<sup>st</sup> January, 2014 with 40 nymphs/leaf and the second recorded on mid April, 2014 with 53 nymphs/leaf.

**Seasonal fluctuations of *H. lataniae* adult female stage:** Adult female stage had three distinct peaks per a year

recorded in early November, mid-January and mid-April, 2013 with 13, 31 and 25 adult females/leaf during the first year of study. In the second year peaks exhibited at early November, mid-January and early May, 2014 with 19, 24 and 26 adult females/leaf, respectively.

**Seasonal fluctuations of *H. lataniae* gravid female stage:** gravid female stage also had three peaks per a year of study. During the first year of study, they recorded at early December, February and mid-May with 27, 29 and 25 ovipositing females/leaf while during the second year they recorded at mid-November, February and mid-May with 17, 22 and 25 ovipositing females/leaf, respectively.

These results were agreement with that obtained by Hassanein and Hamed, (1984) mentioned that *H. latania* had four peaks on *F. nitida* two of them recorded on mid-December and mid-April, Hassan, (1998) revealed that *H. Lataniae* had three peaks showed in January, April and November for both seasons, Mohamed, (1999) recorded three peaks of abundance of these insect on olive trees at Ismailiya Governorate, the first in April, the second in June and the third in August, Helmy, (2014) and Radwan, (2014) showed the seasonal fluctuation of nymphs, adult females and gravid females populations in both studied years had three peaks for each stage.

#### **Duration and number of generations:**

Number of annual field generations was estimated from the graphical representation of age structure technique to the seasonal abundance data of *H. lataniae* obtained over the two years on guava trees and illustrated on Fig (3)&(4)

#### **First year annual generations**

Results illustrated in figure (3)

revealed that presence of three annual generations per a year of study, the first generation lasted about 120 days and was occurred between early September and early January. The second generation lasted 75 days. It was occurred between early January and mid March. The third one lasted about 90 days and occurred between mid March and early June.

#### **Second year annual generations**

Results illustrated in Fig., (4) revealed also three annual generations per the second year of study. Also, they lasted about 120, 90 and 75 days respectively and they nearly occurred in the same periods of the first year generations.

The above mentioned results were agreed with those obtained by El-Minshawy, (1972) stated that *H. lataniae* had three generations a year when reared in laboratory on Pumpkin, the crawlers being present in September- October, March-April and July-August, Salama and Hamdy, (1974) recorded that nymphs of this pest were found during March to April and from July to August on infested trees in Alexandria. Hassan, (1998) stated that *H. Lataniae* had three overlapping generations in both seasons, Mohamed, (1999) found that *H. lataniae* had three generations on olive trees at Ismailia Governorate, Egypt. The first was in April or spring generation, Radwan, (2014) investigated that *H. lataniae* on grape branches had four generations each year of study the first and the fourth occurred on spring and winter respectively, Helmy, (2014) stated that *H. lataniae* had three generations on olive trees at 65 KM of Cairo-Alexandria desert road, the first generation was spring generation.

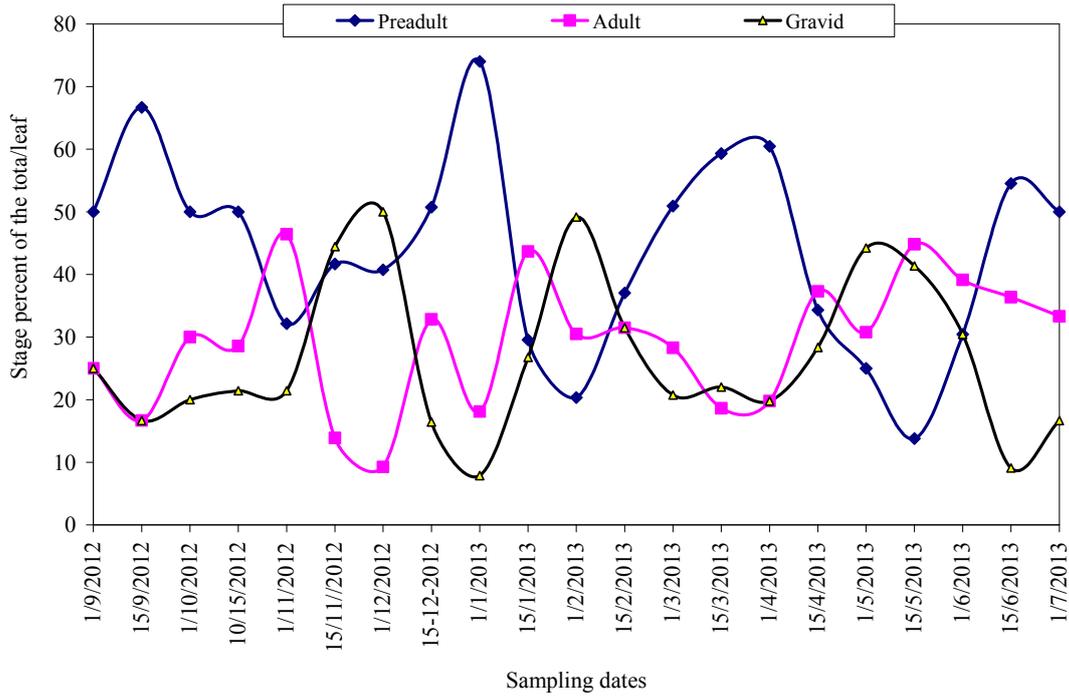


Fig. (3): Age structure of *H. lataniae* on guava trees during 2012/2013.

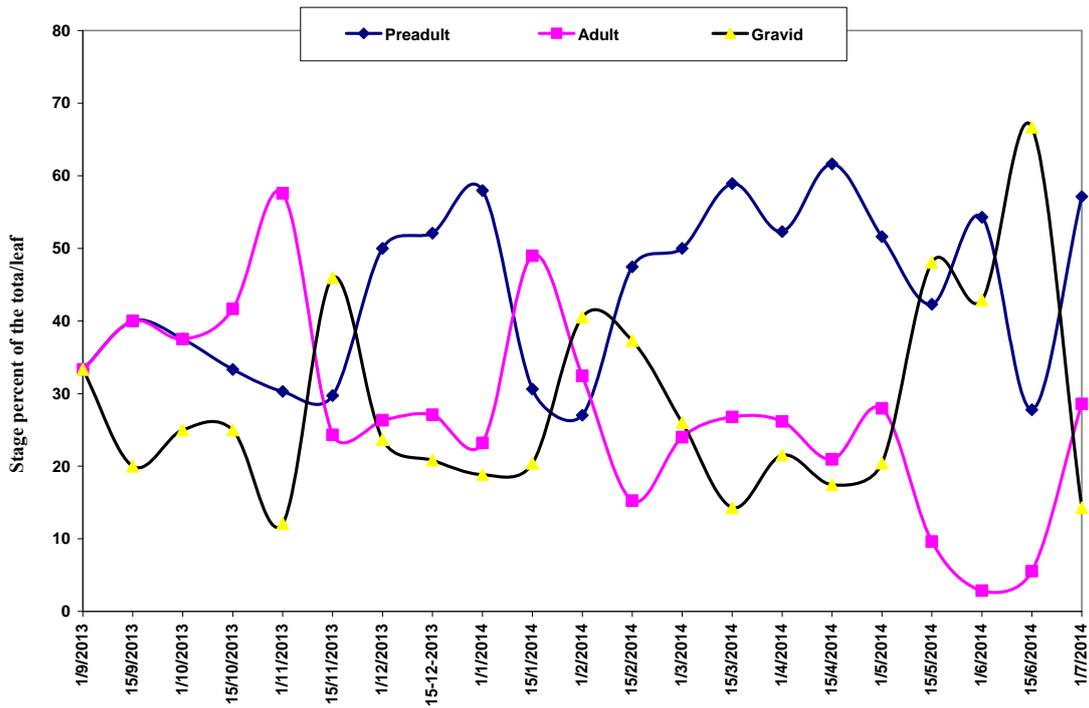


Fig. (4): Age structure of *H. lataniae* on guava trees during 2013/2014.

**Effect of three ecological factors on the population dynamics of *Hemiberlesia lataniae* (Signoret).**

The effect of abiotic factors on *H. lataniae* total population was studied during two years, 2012-2013/ 2013-2014 in Qaliobiya Governorate as in Table(2).

Table (1): simple correlation, regression and partial regression of three abiotic factors with their significant level and percentage of explained variance on the total population of *Hemiberlesia lataniae* (Signoret) at Qaliobiya Governorate during the two years of study.

Year	Factor	Simple corr and reg			Partial regression			
		r	b	P	B	F	P	EV %
2012	Max. Temp.	-0.9092	-5.5680	0.0001	-1.00686	32.05	0.0001	84.98
	Min. Temp.	-0.8884	-4.7348	0.0001	-3.97711			
	R. H.	-0.1768	-0.6565	0.4433	-0.78484			
	Age-Age <sup>3</sup>	-	-	-	-	27.58	0.0001	82.96
2013	Max. Temp.	-0.6722	-3.43017	0.0008	-6.6931	11.1	0.0003	66.2
	Min. Temp.	-0.5801	-2.46172	0.0058	2.1355			
	R. H.	-0.1745	-0.55326	0.4492	-1.3154			
	Age-Age <sup>3</sup>	-	-	-	-	32.84	0.0001	85.28

**Effect of day maximum temperature.**

The results of the statistical analysis of simple correlation stated that the simple correlation coefficient was negatively significant during the two years of study -0.9092 and -0.6722 respectively. Also simple regression was negatively significant during the two years of study -5.5680 and -3.43017 respectively, also the partial regression coefficient of *H. lataniae* total population during the two years of study gave negative and significant during the two years of study recording -1.00686 and -6.6931, respectively.

**Effect of day minimum temperature.**

The results of the statistical analysis of simple correlation stated that the simple correlation coefficient was negatively significant during the two years of study recording -0.8884 and -0.5801, respectively, simple regression was negatively significant during the two

years of study -4.7348 and -2.46172 respectively, also the partial regression coefficient of *H. lataniae* total population during the two years of study gave negative and significant during the two years of study recording -3.9771 and 2.1355, respectively.

**Effect of daily mean relative humidity.**

As shown in (1) table the daily relative humidity and the total population of the studied pest had negatively insignificant simple correlation and regression during the two studies year. Also the partial regression was positively insignificant during the two years of study.

**The combined effect of the climatic factors.**

The combined effect of the studied climatic factors on the scale insect *H. lataniae* during the two years of study was significant during the two years of

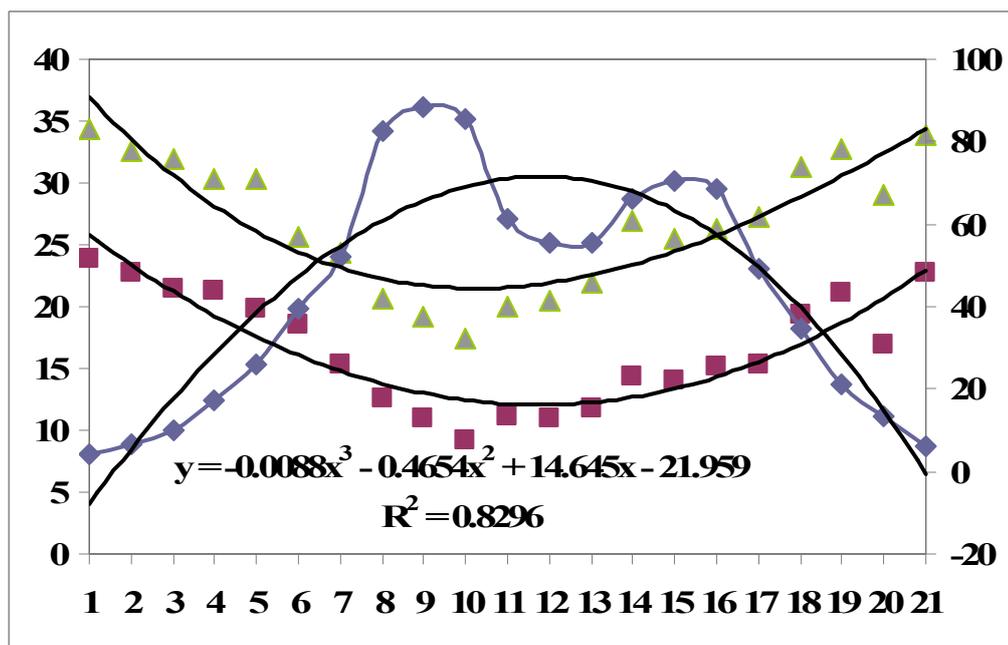


Fig. (5): The relationship between Max. Temp. , Min. Temp. and total population of *H. latanae* during 2012/2013.

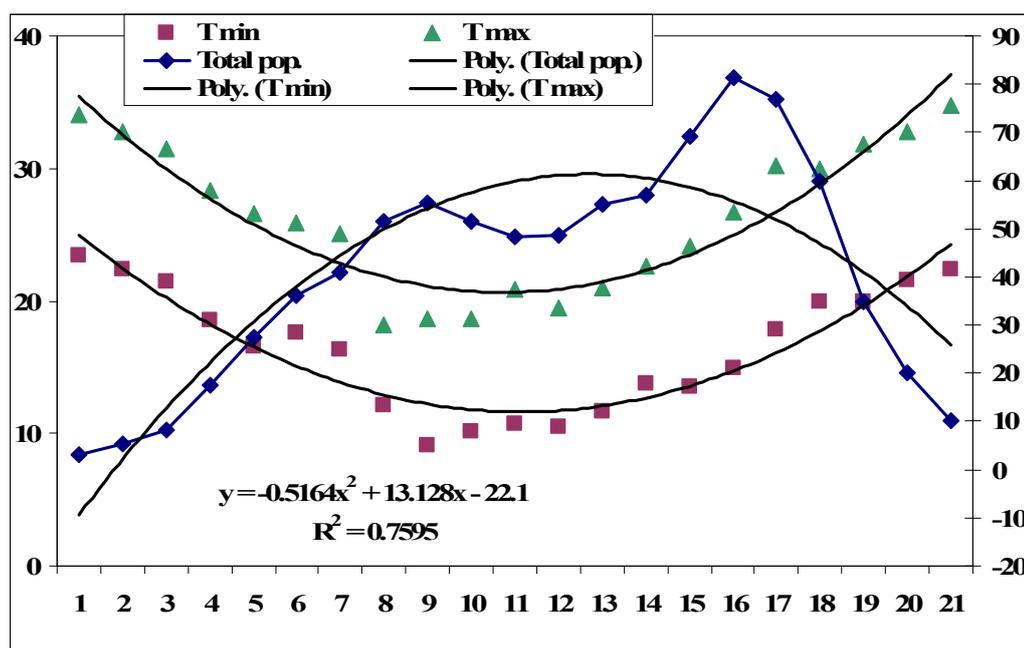


Fig. (6): The relationship between Max. Temp. , Min. Temp. and total population of *H. latanae* during 2013/2014.

study ( $F= 32.05$  &  $11.1$ ), respectively. The explained variance (E.V.) presented ( $84.98$  &  $66.2\%$ ) during the two years of study, respectively.

The statistical analysis results showed that the leaf age in third degree was the

most effective factor during the two years of study where ( $F= 27.58$  &  $32.84$ ), respectively and the explained variance (E.V.) was ( $82.96$  &  $85.28$ ), respectively.

From the pervious statistical analysis the effect of the metrological factors

(Max. Temp., Min. Temp. and R.H. %) was abnormal as illustrated in Fig. (5) and (6) where, the high population simultaneous with low Max. and Min temperatures during 1<sup>st</sup> and 2<sup>nd</sup> seasons. These results were disagree with those obtained by El-Minshawy *et al* (1974) who reared *H. lataniae* at room temperature in the laboratory on pumpkin fruits; rearing was also carried out at constant temperatures of 22 or 27 °C. The two nymphal stages averaged 28 and 17 days, respectively, at 22 °C and 12 and 10 days, respectively, at 27 °C. A generation was completed in an average of about 146 days at 22 °C and 73-92 days at 27 °C. The effect of temperature (20, 23, 25, 27 and 30 °C and ambient in a greenhouse) on population parameters of the diaspidid *H. lataniae* reared on pumpkin. Where the duration of the immature stages was inversely related to temperature. The minimum mean generation time was 64.20 days in the greenhouse at ambient temperature Wang (1990). So the effective factor on the development of *H. lataniae* during this study is the leaf age in third degree where the high population of *H. lataniae* simultaneous with the high content of leaf nutrition.

**Survey of natural enemies associated with *Hemiberlesia latania* (Signoret)**

**Predators:**

Data recorded in Table(3) showed that there were five species of mite identified as predators associated with *H. Lataniae*, during the two years of study and will be showed as following.

The two most abundant were *Amblyserus swirskii* (A-H) and *Agistemus exertus* Gonzales with high population, followed by *Amblyseius enab* (Elbadry), *Euseius scutalis* (A.-H.) and *Tydeu scaliforicus* Banks with low population. These results were in agreement with those obtained by Nassar *et al.*, (2008) who mentioned that *Amblyseius swirskii* (A. – H.), *Euseius scutalis*(A. – H.), *Phytoseius plumifer* (C & F) and *Typhlodromus talbii* (A. – H.) were found inhabiting various habitats at Dakahlia Governorate in association with scale insects and white fly. He was noticed that *A. swirskii* was widely distributed in different localities where it was collected in high numbers from citrus, mango, guava, castor bean and grape trees. Also *Euseius scutalis* occupied the second rank in phytoseiid mites where its population was at its highest level on guava trees.

Also there were other predators with very low population as [*Chrysoperla carnea* (stephens) – *Rodolia cardinalis* (mulsant)].

Table 3: List of predators associated with *Hemiberlesialatania* (Signoret) at Qaliobiya Governorate during the two years of study.

Family	Scientific name	Abundance
Phytoseiidae Berlese	<i>Amblyseius swirskii</i> (A.-H.)	+++
	<i>Amblyseius enab</i> (El-Badry)	+
	<i>Euseius scutalis</i> (A.-H.)	+
Stigaeidae Oudemans	<i>Agistemus exertus</i> Gonzales	+++
Tydeidae Kramer	<i>Tydeu scalifornicus</i> Banks	+
Coccinellidae	<i>Rodolia cardinalis</i> (Mulsant)	+
Chrysopidae	<i>Chrysoperl acarnea</i> (stephens)	+

+++ = over 10 individuals/leaf

++ = 5-10 individuals/leaf

+ = 1 - 5 individuals/leaf

The above results were agreement with those obtained by Helmy (2014) who mentioned *Chrysperla carnea*as a

predator to *H. Lataniae* was released it in the field to controlling this pest and gave good reduction percentage. Also Al-

Fwaeer (2013) stated that *Chrysperla carnea* and *Coccinella* sp. were predators (natural enemies) to the guava trees pests.

#### Parasitoids:

Data tabulated in Table (4) showed the presence of three different parasitoids associated with the scale insect *Hemiberlesia latania*. These parasitoids are as following:

1- *Aphytis* sp (Family: Aphelinidae) which is a primary parasitoid.

2- *Comperiella bifasciata* Howard (Family: Encyrtidae) which is a primary parasitoid.

3- *Mariettja vensis* (Howard) (Family: Aphelinidae) which is a hyper parasitoid and parasitized on the primary parasitoids followed genus *Comperiella*, *Aphytis* and *Habrolepis*

The total number of the three parasitoids during the first year of study was 89 and this number decreased during the second year to reach 53 parasitoid.

Table 4: List of parasitoids associated with *Hemiberlesia lataniae* (Signoret) at Qaliobiya Governorate during the two years of study.

Family	Parasitoid	type
<b>Aphelinidae</b>	<b><i>Aphytis</i> sp</b>	<b>Primary</b>
<b>Encyrtidae</b>	<b><i>Comperiella bifasciata</i> Howard</b>	<b>primary</b>
Aphelinidae	<i>Mariettja vensis</i> (Howard)	secondary

These results were agreement with that obtained by Hassanein and Hamed, (1984) recorded that *H. lataniae* was parasitized by two primary parasitoids, *Habrolepis aspidioti* Compere & Annecke, *Aphytis* sp. and the hyper parasitoid, *Marietta picta*, Abd-Rabou, (1999) who mentioned that two species of aphelinid and encyrtid parasitoids were recorded from samples of *H. latania* these species are *Aphytis mytilaspidis* (Le Baron) and *Habrolepis aspidioti* Compere & Annecke, Hassan, (1998) stated that the main *H. latania* parasitoids were *Aphytis* sp and *Aspidiotiphagus* sp.

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- of *Hemiberlesia latania* (Signoret) and its parasites *Habrolepis aspidioti* Comare & Annecke in Egypt (Homoptera: Diaspididae; Hymenoptera: Encyrtidae).
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## ARABIC SUMMERY

تغيرات التعداد لحشرة اللاتانيا القشرية (*Hemiberlsia lataniae* (Signret) و حصر الاعداء الحيوية المصاحبة لها في محافظة القليوبية.

- سحر علي عطية<sup>١</sup> و مها إبراهيم السيد<sup>١</sup> سحر ياسين عبد العزيز<sup>٢</sup>  
 ١- قسم الحشرات القشرية و البق الدقيقي معهد بحوث وقاية النباتات الدقى. الجيزة مصر  
 ٢- قسم الفسيولوجي كلية الزراعة جامعة القاهرة الجيزة مصر

أجريت هذه الدراسة في منطقة شبين القناطر محافظة القليوبية على أشجار الجوافة التي تعرضت لبعض العمليات الزراعية لتغيير ميعاد إنتاج محصولها في الشتاء حيث تم دراسة التغيرات الموسمية لحشرة اللاتانيا القشرية لمدة عامين متتاليين.

سجلت الدراسة وجود الحشرة طول العام مع وجود ثلاثة أجيال متداخلة في السنة حيث كانت في السنة الأولى من الدراسة مدة الجيل الأول ١٢٠ يوم بدأ من أول سبتمبر حتى أول يناير و الجيل الثاني بدأ من أول يناير حتى منتصف مارس و كانت مدته ٧٥ يوم و الجيل الثالث كانت مدته ٩٠ يوم و بدأ من منتصف مارس حتى أول يونيه. السنة الثانية من الدراسة كان لها أيضا ثلاثة أجيال في السنة في نفس الميعاد و كانت لها تقريبا نفس الفترات.

أوضحت النتائج أن أثناء فترات الأجيال كانت أشجار الجوافة قوية و ممتلئة بالعصارة النباتية و هي فترات تكوين المجموع الخضري و التزهير و الإثمار.

أوضحت النتائج أن الارتباط البسيط للعوامل الجوية (درجة حرارة عظمى و صغرى و الرطوبة النسبية) و التعداد الكلى للحشرة علاقة سالبة و معنوية مع درجتى الحرارة و سالبة و غير معنوية مع الرطوبة النسبية. و هذه النتائج غير منطقية حيث أن المنطقى أن يكون الارتباط موجب و معنوى و هذا ناتج عن الإضطراب الذى حدث لأشجار الجوافة فأصبح العامل المؤثر هو عمر الورقة من الدرجة الثالثة حيث أظهر نتائج موجبة و معنوية أظهرت نتائج حصر الأعداء الحيوية المصاحبة للحشرة عن وجود العديد من المفترسات و الطفيليات المختلفة الأنواع و التعداد حيث سجل خمس أنواع من الأكاروسات المفترسة بوفرة عددية عالية و متوسطة و سجل أيضا أعداد قليلة من أسد المن و حشرة الروداليا.

سجلت النتائج أيضا وجود ثلاث أنواع من الطفيليات *Aphytis* sp. *Comperiella bifasciata* و *Mariettja vensis* (Hawaed) و هو طفيل ثانوى.