

# SEASONAL ABUNDANCE AND CONTROL STUDIES OF TWO DIASPIDID SCALE INSECTS INFESTING APPLE TREES IN EL-GHARBIYA GOVERNORATE.

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## ABSTRACT

Seasonal abundance of *Parlatoria ziziphus* (Lucas) and *Hemiberlisia lataniae* (Sign.) was studied on apple twigs in El- Santa region (El-Gharbiya Governorate) during the period extended from January 1999 to the end of December 2000. The results obtained showed that *P.ziziphus* had the highest population than *H.lataniae*. Its maximum population size was observed in September in both seasons, while the minimum was in January in the first and second years. The favorable periods for annual increase occurred during September in both seasons for both insects. *P.ziziphus* had two annual generations with two peaks in May and September in both years, also *H.lataniae* had two annual generations with two peaks in April and September in the first and second seasons. The seasonal variation in the population in relation to climatic factors showed that the minimum and maximum daily temperature and relative humidity had a moderate effect on the population size. Malathion 57%, K.zoil and Al.kanz 2000 in three concentrations, each were tested against *P.ziziphus* and *H.lataniae*, all insecticides showed high potency on nymphal and adult female stages throughout one, two, four and six months from spraying.

## INTRODUCTION

In Egypt, apple trees are considered among the most eminent horticultural crops, occupying an area about 4000 feddans. During the last 10 years, the population of scale insects suddenly appeared in apple orchards and increased within a short period particularly after the intensive sprays of insecticides. Apple producers greatly suffer from the invasion of the black *Parlatoia ziziphus* (Lucas) and *Hemiberlisia lataniae* (Sign.). The injury to apple trees is caused by the different immature and mature stages. They infest branches leading to defoliation of leaves and dropping of fruits especially with heavy infestation. Tawfik (1985) found that infestation with *P.ziziphus* reduced both physical and chemical properties of orange fruits. The present work was conducted to cover the following aspects:

- 1- The seasonal abundance of two insect species (*P.ziziphus* and *H.lataniae*)
- 2- Effect of some weather factors on the populations of the two insect species.
- 3- Chemical control by some insecticides in order to find out the most effective compound and the proper time of application for controlling the two insect pests.

## MATERIALS AND METHODS

To study the build up of population scale insects, five apple trees were chosen in three replicates, the trees were randomly distributed within a small grove at El-Santa region, El- Gharbiya Governorate. To study the seasonal variation: monthly samples of 30 twigs (20cm), were collected to represent every area of the trees. [ Six branches from each tree, one from each side (north, south, west, and east) and two branches from the core. The basic and the terminal part of the brache excluded and the middle part with 20cm. Length was examined.] The numbers of scale insects (Nymphs and adult females) within those areas were recorded. The samples were collected during the period from January 1999 to December 2000. In the laboratory insects were identified and sorted into their different stages.

To study the effect of some weather factors on the population density of these insects: (the seasonal simple correlation and the partial regression values of the half monthly counts of *P.ziziphus* and *H.lataniae* with each of three weather factors (Minimum temp. Maximum temp. and relative humidity) were estimated.

To study the control of the Diaspidid scale insects, the experiment was carried out on 15<sup>th</sup> may 2000 at 24.85 °c and 67.86 R.H %. The application of insecticides were as follow: Malathion 57% at the rates of 1.0, 1.5 and 2.5 ML/L, K.zoil (mineral oil) at the rates of 10,15 and 25 ML/L And Al.Kanz 2000 at the rates of 5, 7.5 and 10 ML/L. Five apple trees in three replicates for each treatment were sprayed with each concentration, five trees were left untreated as check. Sample of 30 twigs (20cm), were collected once before treatment and four-post treatment at one, two, four, and six months from spraying were tested. Nymphs and adult females were counted in each sample. [ Six branches from each tree, one from each side (north, south, west, and east) and two branches from the core. The basic and the terminal part of the brache excluded and the middle part with 20cm. Length was examined.] Percentage of reduction in different stages were calculated according to Staphord and Summers (1963).

## RESULTS AND DISCUSSION

### Seasonal variations:

Monthly counts of different scale insects infesting apple twigs are given in Table (1and 2) and fig.(1) *P. ziziphus* (Lucas) had the highest population than the other species *H. lataniae* (Sign.). Its populations attained the maximum size in September with 556.66 and 507/10 twigs, while the minimum level occurred in January with 142.0 and 105.67/10 twigs in the first and second season, respectively.

TABLE1+2

fig

Counts of *H.lataniae* showed that the population reached its maximum in September with 499.67 and 481.34 / 10 twigs, while the minimum level occurred in January with 51.33 and 33.0/10 twigs in both years, respectively.

These results are in agreement of those El – Minshaway *et al.* (1972) whom reported that *H.lataniae* reached maximum abundance in September. Also Salama and Hamdy. (1974) mentioned that *H.lataniae* reached maximum abundance in September. and had an optimum temperature of 25.3-26 °c. El– Bolok *et al.* (1987) also stated that the highest population of *P.ziziphus* occurred in autumn and the minimum occurred in winter.

### **Monthly variations (V.)**

The monthly variations of *P.ziziphus* and the population density in relation to temperature and relative humidity as a biotic factors are presented in table (1 and 2). The obtained results indicate that the favorable periods for annual increase on apple twigs occurred during September in both seasons, being 2.29 and 2.22 for *P.ziziphus*, while it recorded 4.02 and 4.27 in the first and second years for *H.Intaniae*. These values were obtained at an average of (26.62 °c and 64.67 R.H.%) in the first season and ( 26.42 °c and 63.83 R.H.%) in the second one. These climatic conditions prevailing during the favorable periods on which the highest quotient of increase was attained on twigs, seems to be favourable for increase and development of *P.ziziphus* and *H.lataniae* on apple trees at El-Gharbiya Governorate.

The unfavourable period for this insects development was observed during November with monthly variations values of (0.52 and 0.51) and (0.49 and 0.42) for *P.ziziphus* and *H.lataniae* in the first and second years, respectively, where the temperature and % relative humidity during this period were 19.83 °c and 64.09. R. H% in the first year, while in the second year were 19.20 °c and 63.80 R.H. %.

Amin and salem. (1980) indicated that the favourable time for the annual increase of *P.ziziphus* was in May-June (value = 1.55).

### **Number of generations**

Depending on the percentages of nymphal stage, (Table 1 & 2) it can be concluded that *P.ziziphus* has two generations a year, the first one was begun in April and continued till July, reaching its peak during May, where the percentages of nymphs /10 twigs were 43.81 and 46.19% during the first and second years. The second generation extended from July till the next spring , showing a peak during September with nymphal percentage of 48.20 and 47.79% during the first and second years, respectively.

Also, *H.lataniae* has two generations a year, the first one was begun in March and continued till July, the peak took place in April, where the percentage of nymphal /10 twigs were 55.19 and 51.12% during the two years. The second generation extended from July till the next spring, showing peaks with 48.76 and 47.50% / 10 twigs during the first and second year, respectively.

El-Minshaway *et al.* (1972) also reported that *H.lataniae* had two generations a year in the field, reaching maximum abundance in September. Salama and Hamdy (1974) mentioned that *H.lataniae* (Sign.) had two generations a year, reached a maximum abundance in September, and had an optimum temperature of 25.3-26 °c. Amin and Salem (1980) stated that *P.ziziphus* had two annual, generations, the first in April and the second in October. El-Bolok *et al.* (1987) stated that *P.ziziphus* had two annual generations.

**Effect of some weather factors on the populations of *P.ziziphus* (Lucas) and *H.lataniae* (Sign.)**

Data in Table (3) show the seasonal simple correlation (r ) and partial regression (b) values of the half monthly counts of *P.ziziphus* and *H.lataniae* with each of the three weather factors tested.

**A. Effect of the daily minimum temp. :**

1. **On nymphal population:** the simple correlation values were significant in the first and second year on *P.ziziphus*, but insignificant in both years on *H.lataniae*. The partial regression values indicate that the effect of the minimum temp. on the population proved to be significant in the first year and insignificant in the second one, in case of *P.ziziphus*, but insignificant in both years on *H.lataniae*
2. **On adult females populations:** the simple correlation values were significant in both years on *P.ziziphus*, while insignificant in the first year and significant in the second year on *H.lataniae*. The partial regression value was insignificant in the first and second years on *P.ziziphus* and insignificant in the first year on *H.lataniae* and significant in the second year.

**B. Effect of the daily maximum temp:**

1. **On nymphal population;** the simple correlation was significantly positive in both years. The partial regression value was non-significant in both years in case of *P.ziziphus*. The simple correlation and the partial regression value were non-significant in bot years on the population density of *H.lataniae*.
2. **On adult females;** the simple correlation was significantly positive in the first and second years. The partial regression value was insignificant in first year but significant in second year on *P.ziziphus*. The simple correlation and the partial regression were non – significant in both years on the population density of *H.lataniae*.

**C-Effect of % relative humidity:**

1. **On nymphal populations:** The simple correlation and the partial regression value were non-significant in both years on the population density of *P.ziziphus*, but they were negative and significant in the first and second years and the partial regression was non-significant in both years on *H.lataniae* population.

2. **On adult females;** The simple correlation was negative and significant in both years, and the partial regression was non-significant in first and second years on the population of *P.ziziphus*. The simple correlation was significant in the first year and non-significant in second one and the partial regression were non-significant in both years on *H.lataniae* population density.

From the previously mentioned results, it could be concluded that the weather factors complex evoked a considerable effect on the activity of *P.ziziphus* and *H.lataniae*. It is believed that these factors might be regarded as physical regulating factors which govern the activity of the insect population in El-Gharbiya Governorate. Similar findings were reported by Hafez and Salama (1965), Soliman (1970), Ahmed (1975) and Helmy (1982).

#### **Chemical control of *P.ziziphus* and *H.lataniae* by some insecticides**

Data presented in Table (4 and 5) indicated that insecticides gave good results against *P.ziziphus* and *H.lataniae*. These results showed that Malathion 57% was the most effective against the two diaspidid scale insects. The efficiency of the three insecticides varied according to their concentrations, stage of the insect and the time of elapsed after application. The nymphal stage was the most sensitive stage to the different concentrations throughout one, two and four months from spraying. Samia Nada *et al.* (1990) stated that Malathion 57% at 0.3% conc., the insect reduction percent was 88% against the diaspidid *I.pallida* during May spray.

Analysis of variance of the tested insecticides showed significant values between concentrations, there were highly significant difference between the efficiency estimated in the four post treatment counts after application. These data clearly showed the superior long activity of the tested insecticide (k.zoil) against adult females. On the other hand, the three tested scalicides against nymphs were most efficient for a short time of application one and two months than four and six months.

Ekram *et al.* (1992) indicated that k.zoil was found to be the most effective against *L.beckii* (Newm.) infesting navel orange, the nymphal stage was the most sensitive stage throughout one and three months from spraying and the adult females were highly affected after six months.

The results indicates that the chemical control with organophosphorous (Malathion 57%) or summer oil zoil or extract plant (Al-kanz 2000) are more effective during spring spray. The application time of insecticides are related to the population of insects especially the number of nymphs of *P.ziziphus* and *H.lataniae*, which the highest population always occurs in May and the other generation occurs in September.

These results are in agreement with those obtained by De Bach (1969), Helmy *et al.* (1984), Abdel – Magged *et al.* ( 1988) and Samia Nada *et al.* (1990).

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دراسات على الوفرة الموسمية لزوج من الحشرات القشرية التابعة لفصيلة دياسبيددي *Diaspididae* التى تصيب أشجار التفاح وطرق مقاومتها بمحافظة الغربية.

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- أقيمت التجربة بمحافظة الغربية بمنطقة السنطة خلال موسمى ١٩٩٩ و ٢٠٠٠ واستهدفت البحث دراسة الوفرة النسبية لحشرتى النبق القشرية *Parlatoria ziziphus* وحشرة اللاتنيا *Hemiberlisia lataniae* على مدار عامى التجربة. ودراسة عدد الأجيال على أفرع التفاح وتأثير العوامل الجوية على الكثافة العددية للحشرتين وكذلك دراسة طرق مقاومتها.
- أثبتت الدراسة أن الكثافة العددية لحشرة *P.ziziphus* أعلى منها من حشرة *H.lataniae* وأن الكثافة العددية تصل الذروة خلال شهر سبتمبر فى كلا الموسمين لكلا الحشرتين وذلك عند درجة حرارة ٢٦,٦٢ درجة مئوية و ٦٤,٦٧% رطوبة نسبية فى الموسم الأول و ٢٦,٩٢ درجة مئوية و ٦٣,٨٣% رطوبة نسبية فى الموسم الثانى.
  - كما أثبتت أن شهر سبتمبر هو أنسب فترة لنمو وتطور كلا الحشرتين فى كلا العامين .
  - وأن لحشرة النبق القشرية جيلين فى العام ويصل الذروة فى الجيل الأول فى شهر مايو وفى الجيل الثانى فى شهر سبتمبر .
  - وأن لحشرة اللاتنيا جيلين فى العام ويصل الذروة فى شهرى أبريل وسبتمبر .
  - كما وجد أن للعوامل الجوية ( الحرارة الصغرى والعظمى والرطوبة النسبية ) تأثير معنوى على الكثافة العددية لكلا الحشرتين فى طورى الحوريات والإناث الكاملة فى كلا الموسمين أثناء إقامة التجربة.
  - وأن استخدام المبيد الفسفورى (الملاثيون ٥٧%) والزيت المعدنى (K. z oil) والمستخلص النباتى (AI - Kanz 2000) فى ثلاث تركيبات ضد حشرتى النبق القشرية وحشرة اللاتنيا كان له تأثير معنوى فى اختزال الكثافة العددية للحوريات والإناث الكاملة بعد ١ و ٢ و ٤ و ٦ شهور من ميعاد الرش.

**Table [1]: Monthly counts of P.ziziphus (Lucas) and H.lataniae (Sign.) on apple twigs at EL. Gharbiya Governorate during 1999.**

Month	Mean No./10 twigs									
	p.ziziphus					H.lataniae				
	Nymph	Adult female	Total	Nymph %	(V.)	Nymph	Adult female	Total	Nymph %	(V.)
Jan.	0.0	142.0	142.0	0.0	-	0.0	51.33	51.33	0.0	-
Feb.	0.0	168.33	168.33	0.0	1.19	0.0	79.0	79.0	0.0	-
Mar.	0.0	179.33	179.33	0.0	1.07	60.67	80.0	140.67	43.13	1.07
Apr.	113.67	202.33	316.0	36	1.76	111.67	90.67	202.34	55.19	1.76
May	172.33	221.0	393.33	43.81	1.24	72.67	48.0	120.67	60.22	1.24
Jun.	125.0	189.67	314.67	39.72	0.80	23.0	59.33	82.33	27.94	0.80
Jul.	62.33	160.67	223.0	27.95	0.71	9.0	43.0	52.0	10.42	0.71
Aug.	67.0	176.33	243.33	27.53	1.09	60.0	94.33	154.33	38.88	1.09
Sep.	268.33	288.33	556.66	48.20	2.29	243.67	256.0	499.67	48.76	2.29
Oct.	153.33	264.33	417.66	36.71	0.75	139.33	201.0	340.33	40.44	0.75
Nov.	36.33	182.0	218.33	16.63	0.52	4.33	163.33	167.66	2.58	0.52
Dec.	0.0	151.67	151.67	0.0	0.69	0.0	144.67	144.97	0.0	0.69

V. = Monthly Variation

**Table [2]: Monthly counts of P.ziziphus (Lucas) and H.lataniae (Sign.) on apple twigs at El. Gharbiya Governorate during 2000.**

Month	Mean No./10 twigs									
	p.ziziphus					H.lataniae				
	Nymph	Adult female	Total	Nymph %	(V.)	Nymph	Adult female	Total	Nymph %	(V.)
Jan.	0.0	105.67	105.67	0.0	-	0.0	33.0	33.0	0.0	-
Feb.	0.0	142.0	142.0	0.0	1.34	0.0	54.67	54.67	0.0	1.66
Mar.	0.0	152.33	152.33	0.0	1.07	39.67	52.67	92.34	42.96	1.68
Apr.	91.33	164.33	255.66	35.72	1.68	106.67	102.0	208.67	51.12	2.26
May	149.33	174.0	323.33	46.19	1.26	37.67	37.67	75.34	50.0	0.36
Jun.	86.0	190.33	276.33	31.12	0.85	18.33	68.0	86.33	21.33	1.15
Jul.	61.33	150.0	211.33	29.02	0.76	10.0	30.0	40.0	25.0	0.46
Aug.	60.0	168.67	228.67	26.24	1.08	28.0	84.67	112.67	24.85	2.82
Sep.	243.0	264.0	507.0	47.79	2.22	228.67	252.67	481.34	47.50	4.27
Oct.	192.0	233.33	365.33	36.13	0.72	143.67	182.0	325.67	44.11	0.68
Nov.	25.0	163.0	188.0	13.30	0.51	0.0	137.33	137.33	0.0	0.42
Dec.	0.0	133.33	133.33	0.0	0.71	0.0	127.33	127.33	0.0	0.93

V. = Monthly Variation

Table [3]: Simple correlation ( r ) and partial regression values (b) of P.ziziphus (Lucas) and H.lataniae (Sign.)with minimum, maximum temperature and relative humidity during 1999 and 2000 years.

Year	Species	stage	Minimum		Maximum		r
			r	b	r	b	
			1999	<i>P.ziziphus</i>	Nymph	** 0.868	
		Adult female	*0.513	0.063	*0.536	0.076	** -0.
	<i>H.lataniae</i>	Nymph	0.292	0.018	0.316	0.026	*-0.
		Adult female	0.159	0.012	0.071	-0.006	*-0.
2000	<i>P.ziziphus</i>	Nymph	**1.0	0.042	**0.663	0.051	0.2
		Adult female	**0.643	0.082	**0.731	*0.108	*-0.
	<i>H.lataniae</i>	Nymph	0.245	0.016	0.300	0.021	*-0.
		Adult female	** 0.676	*0.046	0.077	0.006	- 0.2

Table [4]: Reduction percent of P.ziziphus on apple twigs at EI – Gharbiya Governorate

Treatment	Conc.	1 Month		2 months		4 Months		6 Months	
		Nymph	Adult female	Nymph	Adult female	Nymph	Adult female	Nymph	Adult female
Malathion 57%	1 ML/L	84.0	81.6	83.6	82.0	82.6	81.0	80.4	72.0
	1.5ML/L	91.0	86.3	86.6	87.8	85.0	82.1	84.0	77.2
	2.5 ML/L	93.9	89.2	91.0	90.3	90.0	86.7	88.3	82.0
K.z oil	10 ML/L	83.0	74.1	81.3	72.4	80.0	62.5	71.0	73.2
	15 ML/L	85.5	80.8	83.9	83.4	83.0	69.2	78.0	81.4
	25 ML/L	86.5	84.8	85.0	84.0	84.3	70.0	80.2	82.0
Al-kanz 2000	5 ML/L	66.3	66.0	64.0	63.6	621.3	60.0	60.0	56.0
	7.5 ML/L	73.8	72.0	71.0	70.4	69.0	68.0	66.0	62.0
	10 ML/L	75.8	74.0	74.0	73.0	73.0	72.2	70.6	65.0
L.S.D. at 5%		3.10	6.23	4.50	8.30	7.18	6.27	4.50	3.40

\* Spraying date 15.5. 2000

Table [5]: Reduction percent of H.lataniae on apple twigs at EI – Gharbiya Governorate

Treatment	Conc.	1 Month		2 months		4 Months		6 Months	
		Nymph	Adult female	Nymph	Adult female	Nymph	Adult female	Nymph	Adult female
Malathion 57%	1 ML/L	85.2	82.3	84.1	81.8	83.8	79.6	81.9	
	1.5ML/L	92.3	88.2	88.3	87.9	86.1	84.5	83.0	
	2.5 ML/L	94.8	90.4	92.0	89.2	91.2	87.9	86.6	
K.z oil	10 ML/L	81.3	75.0	82.7	73.4	81.9	62.0	70.1	
	15 ML/L	84.5	81.2	85.1	82.6	82.2	71.5	80.0	
	25 ML/L	85.8	83.9	87.0	84.8	83.8	72.2	81.8	
Al-kanz 2000	5 ML/L	67.4	66.4	64.8	64.8	61.9	60.2	61.1	
	7.5 ML/L	70.8	72.3	72.8	71.4	71.0	64.3	71.8	
	10 ML/L	75.2	75.8	76.2	73.1	75.3	70.4	73.0	
L.S.D. at 5%		5.61	5.30	7.36	9.41	6.47	7.19	2.98	

\* Spraying date 15.5. 2000

Nymph  
Adult female

Nymph  
Adult female