SEASONAL ABUNDANCE OF *PARLATORIA BLANCHARDII* (TARG.-TOZZ.) AND THE ASSOCIATED PARASITOID *PETEROPETRIX AEGYPTICA* ON DATE PALM IN QALIOBIYA GOVERNORATE

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Abstract

Seasonal abundance of *Parlatoria blanchardii* (Targ-Tozz) and the associated parasitoid *Peteropetrix aegyptica* were studied for two successive years (2012-2013) & (2013-2014) on date palm in Qalio1biya Governorate. The obtained results revealed that *P. blanchardii* found on date palm trees all over the year and had four overlapping generations per a year. The 1st generation started from 1st July to 1st October (summer) with duration of 3-3.5 months, the 2nd started from mid October to mid January (winter), its duration was 3.5-4 months, the 3rd generation started from 1st February till mid April (late winter), its duration was 3 months and finally the 4th generation started from 1st May till mid June (spring). The second year of study had nearly the same result. *Peteropetrix aegyptica* was a primary parasitoid recorded associated to *Parlatoria blanchrdii* and had four periods of activity per a year. The highest period was recorded in summer in the first year but it recorded in winter during the second one. Rate of parasitism during the second year was higher than the first year. One Climatic factors (Min, Max. Temp. & R. H.) give positive highly significant correlation with the pest different stages. Multiple regression was insignificant except Min. Temperature which proved positive and highly significant. Also the combined effect of the three climatic factors was positive and significant. The changes in the half monthly count of the nymph, adult, gravid females populations related to the effect of the tested weather factors were 91.02, 92.36&90.3%, respectively during the first year and 95.76, 86.74&80.95%, respectively during the second year of study.

INTRODUCTION

Date palm *Phoenix dactlifera* L., (Fam. Palmaceae) is one of the most important horticultural crops in Egypt. Cultivation of date palm trees in Egypt goes back to thousands of years. (Loutfy, 2010). Date palm is subjected to infestation with a variety of insects, some of which may rank to serious pests. Among these pests are scale insects, mealy bugs, lepidopterous larvae and adults. Frequent observation reveals that the scale insect *Parlatoria blanchardii* (Tatg.-Tozz.) order Homoptera, suber family (Coccoidea, Fam. Diaspidae), proved to be one of the most important insect pests which infest date palm trees in Qaliobiya Governorate. Immature and

mature females scale insect often occur on the various parts of offshoots and palm (El-Said, 2000). This pest sucks the plant sap causing weakness of the tree and deformations by the action of the toxic saliva. Severe infestation causes the drying out of the branches and cortical lesions form, yellow and dropping and distortion of the foliage and fruit blossoms, tumor formation, deterioration of palm and flower abscission, leaf rolling, chlorosis leaf dropping, shoot twisting and strong malformation of fruits. So that, the quality and quantity of date fruit yield are significally affected or decreased (El-Sherif *et al.*,1998,El-Said, 2000, Abivardi, 2001, El-Sayed, 2007 and Blumberg, 2008) Therefore, the present investigation was oriented towards studying the seasonal fluctuation of the scale insect *Parlatoria blanchrdii* and the associated parasitoid *Pteroptrix aegyptica* Evas and Abd- Rabou (Hymenoptera: Aphelinidae) .

MATERIALS AND METHODS

The present work was carried out in a date palm orchard at Qaliobiya Governorate Shebeen El-kanater area, throughout two successive years started from 1st July 2012 till mid June 2014, to determine the seasonal fluctuation in the population density of the *Parlatoria blanchardii* (Targ.-Tozz.) and the associated parasitoid *Peteropetrix aegyptica* . Four palms of almost similar age, vegetation and height were chosen for sampling which was conducted at half-monthly intervals. Samples of 30 leaflets (10 leaflets x 3 replicates) were picked out from the date palms. 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 follow:

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 which were as follow:

Larvae of the parasitoid, pupae of the parasitoid and the rate of parasitism was calculated according to the formula of **Orphanides (1982):**

$$\% \text{ Parasitism} = \frac{\text{No. parasitized scale insects}}{\text{Total No. parasitized and non parasitized scale insect}}$$

The number of annual generations and their durations of *P. blanchardii* were estimated by applying Jacob (1977) formula, through out the two successive years of investigation.

RESULTS AND DISCUSSION

1**- Population fluctuations**:

Figs. (1&2) show the half-monthly population fluctuations of the nymph, adult female and gravid female stages and total population of *Parlatoria blanchardii* at Qaliobiya Governorate in 2012-2013 & 2013-2014 seasons.

1- Seasonal fluctuation of total population. The total population of *P. blanchardii* had four peaks per year, during the first year of study the peaks were recorded in early September, early December, early January and early June with 1597, 677, 633 & 1374 insect/leaflet . During the second year of study the four peaks recorded in late summer (mid September) with 708 insect/leaflet, autumn (early November) with 169, winter (early February) with 280 insect/leaflet finally the fourth one recorded in spring season (mid May) with 838 insect/leaflet.

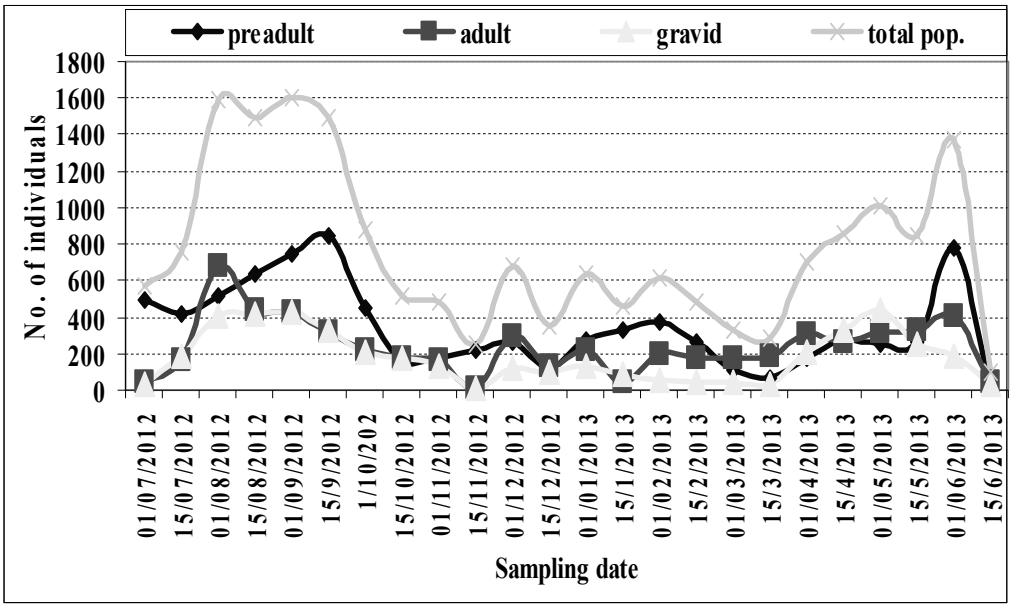

Fig. 1. Seasonal fluctuations of *Parlatoria blanchardii* total population and different stages during 2012-2013.

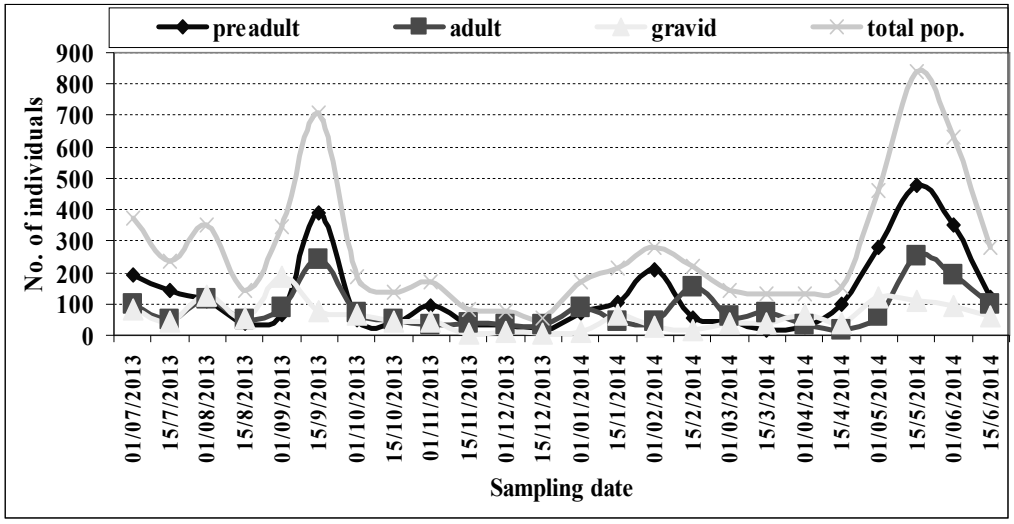

Fig. 2. Seasonal fluctuations of *Parlatoria blanchardii* total population and different stages during 2013-2014.

2- Different stages of *Parlatoria blanchardii.*

a- seasonal fluctuation of nymphal stage. Data illustrated in Fig. (1) showed that nymphal stage had four peaks per year occurred in mid September, early Decemder, early February and early June with mean number of (848, 267, 368&781nymph/leaflet) respectively during the first year of study. Also there were four peaks of nymphal stage during the second year of study in mid September, early November, early February and mid May with mean number of (388,95,210 & 479 nymph/leaflet) respectively.

b- Seasonal fluctuation of adult stage. The same figure showed that, adult female had three peaks per year. During the first year these peaks were 681adult female, the highest one in early August, 292 adult female/leaflet in early December,308 adult female/leaflet in early April and finally 401adult female/leaflet in early June. During the second year the population was lower than the first year where the peaks were (117, 242, 151&250 adult female/leaflet) recorded in early August and the mid of (September, Fibruary & May) respectively.

c- Seasonal fluctuation of gravid females. Data in the same figure showed that, the gravid females had three peaks per year of study and also the population of the second year was lower than the first year. The peaks of the first year were recorded in 1st September with 425 gravid female/leaflet, early January with 133 gravid female/leaflet and 1st May with 441 gravid female/leaflet. In addition, the three peaks of the second year recorded in early September, mid January and early May with population of 189, 65 &120 gravid female respectively.

During these periods of the peaks the climatic factors (Min, Max temperature & % Relative humidity) were suitable and the studied pest fluctuated according to the phonology of the date palm tree.

Finally from the preceding study it could be concluded that the *Parlatoria blanchardii* had four seasonal activity periods, the highest periods recorded in spring and late summer or autumn because of the favorable climatic factor which ranged between (16.5-22.7°C) Min., (20.8-32°C) Max temperature and (40.28- 64.08%) relative humidity and also depend on the activity of the tree, when the tree was vigor and full of sap the activity of the pest was increased.

These results are agree with, Avidov & Harpaz (1969) they mentioned that, in middle east, the crawler population of *P. blanchardii* peaked tree times a year in February, May and October-November and also agree with Hussain (1996) who showed that the population density of the same pest on date palms at Bharia oases had three distinct peaks in October, March and July, whears in Giza the three peaks occurred in November, February and May, Kehat *et al.* (1974) reported that the population of this insect was increased during spring and autumn, Bakry (2014) stated that *Parlatoria blnchardii* total population and different stages had four peaks per a year in Esna district, Luxor Governorate.

Number and duration of the annual generations.

Data of the half monthly counts of nymphal stage of *Parlatoria blanchardii* on date palm leaflets in Qaliobiya Governorate during 2012-2013 and 2013-2014 were used to estimate number and durations of annual field generations.

Figs. (3&4) indicated that *P. blanchardii* had four overlapping generations per a year as follows

Generations of the first year of study,

1- **The first generation:** It started from the first of July (2012) till, 1st October with the duration of three months and half its peak was 848 nymph/leaflet. This generation was the highest peak. These results due to the suitable and high climatic factors which ranged between, Min. (21.5-24.82ºC), Max. tempratures (31.88-35.7ºC) & R. H. (49.07-59%).

2- **The second generation:** It began from mid October and end at mid January its period was 3.5 months, and its peak was 276 nymph/leaflet. The climatic factors ranged between Min. (9.21-21.36ºC), Max. (17.36-30.36ºC) temperature and R.H. (51.62-64.07%).

3- **The third generation:** started from 1st February till mid April, with the duration period of three months and its peak was 368 nymph/leaflet. During this

generation the climatic factors recording Min.temp. (10.93-15.14ºC), Max. temp. (19.94-20.86ºC) temperatures and R. H. (39.07-51.00%).

4- **The fourth generation:** which was the shortest one with duration of 2 months started from 1st May to mid June its peak was 781 nymph/leaflet, climatic factors ranged between Min. temp. (15.31-21.12ºC), Max. temp. (27.19-32.76ºC) & R.H. (37.47-56.00%).

During the first year the parasitoid number and rate of parasitism were low to effect on number and duration of *P. blanchrdii* genertions.

Generations of the second year of study.

1- **The first generation:** Started from early July 2013 till mid September 2013, its duration was three months and its peak was 388 nymph/leaflet. The climatic factors ranged between Min. (22.21-23.93ºC), Max. temperature (32.29-34.57ºC) and R. H. (51-59.71%), also rate of parasitism ranged between (0.28-11.66%)

2- The second generation: It was the lowest one and started from early October till mid January 2014 with duration of four months and its peak was 95 nymph/leaflet. The climatic factor ranged between Min. (9.13-21.44ºC), Max. temperature (18.21-31.44ºC) and R.H. (51.44-66.93%), when the rate of parasitism ranged from 0.00 to 22.66%.

3- The third generation: Occurred from early February to the mid of April, it elapse about 3 months, with a moderate peak (210 nymph/leaflet) under field condition Min. (10.5-14.93ºC), Max. (19.42-26.71ºC) & R.H. (45.7-60.71%) while rate of parasitism ranged between (1.90-18.19 %).

4- The fourth generation: Permanency about 2 months, it was the shortest and highest one which started from first May to the end of the year of study, its peak reach to 479 nymph/leaflet and field conditions were, Min. (17.84-21.54 ºC), Max. temperature (30-32.79ºC), R.H.(40.29-45.75%) and rate of parasitism were (0.59-3.42%)

Reviewing the obtained results it could revealed that, the generation durations were nearly in the same period during the two years of study but the density of the second year generations were lower than the first year generations due to highness of rate of parasitism. The first generation density was high because of favorable climatic factors and low rate of parasitism. On the second generation, density was the lowest one and its duration was the longest one because of the low temperatures and high rate of parasitism. During the third generation the population density raised because the tree was vigor, the temperature start to rise and the rate of parasitism started to decrease. Finally the population density of the fourth generation was high due to the

high vigor tree to give the fruit (full of plant sap), also it was the shortest one because of high climatic factors

These results are agree with Benassy (1990), Abdel-Kareim and Awadalla (1998), Abivardi (2001), El-Sherif *et al*. in North Sinai (2001), Elwan and El-Said (2009) in Egypt and Bakry (2014) in Luxor stated that the *P. blanchardii* had four overlapping generations per a year.

Table 1. Number and durations of the annual generations of *Parlatoria blanchardii* on date palm trees at Qaliobiya Governorate (2012-2014).

Generations	Data from---- to	Duration in months	Peak nymph / leaflet
First year 2012-2013			
1st Generation	From 1st July to 1st October	3.5	848
2nd Generation	From mid October to mid January	3.5	267
3rd Generation	From 1st February to mid April	3	368
4th Generation	From 1st May to mid June	2	781
Second year 2013-2014			
1st Generation	From 1st July to mid September	3	388
2nd Generation	From 1st October to mid January	4.5	95
3rd Generation	From 1st February to mid April	2.5	210
4th Generation	From 1st May to mid June	2	479

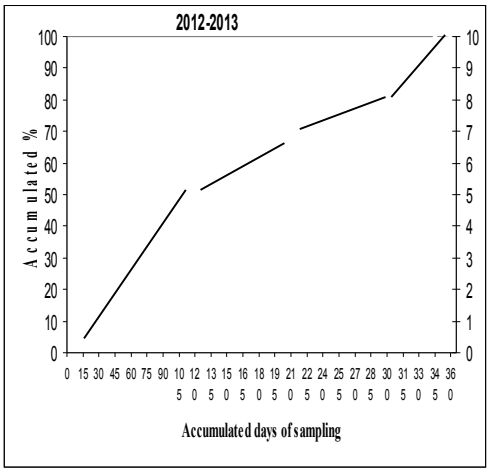

Fig. 3. Number and duration of field generations of *Parlatoria blanchardii* on date palm according to Jacob (1977) at Qaliobiya Governorate during (2012-2013) .

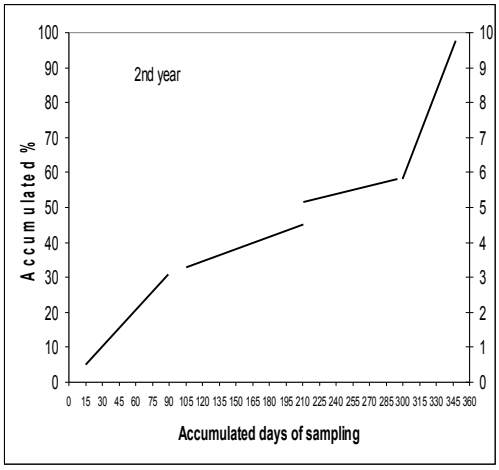

Fig. 4. Number and duration of field generations of *Parlatoria blanchardii* on date palm according to Jacob (1977) at Qaliobiya Governorate during (2013-2014).

Seasonal fluctuation of *Pteroptrix aegyptica* As a mortality biotic factor influencing *P.blanchardii* population density on date palm trees:

Laboratory examination of collected date palm leaflets infested by *P. blanchardii* showed the presence of one Hymenopterous parasitoid; *pteroptrix aegyptica* belonging to order Hymenoptra, family Aphelinidae. It is highly host specific ecto parasite of date palm scale insect *p.blanchardii*.

Analysis of data showed in Figs. (5&6) proved that *Pteroptrix aegyptica* total population had a dynamic curve with four peaks per a year, during the first year of study they recorded on early August (32 individual/leaflet), early November(12 individual/leaflet), mid December (18 individual/leaflet) and the last peak on mid April (16 individual/leaflet). Besides during the second year of study there were also four peaks recorded on mid August, mid November, early February and mid May with (19, 24, 55&16 individual/leaflet) respectivly. On the other hand there were three depressions, the first recorded on 1st July with 1individual/leaflet, the second one recorded on mid October with 0 individual/leaflet and the third one was depression period, started from mid May till end of the year with 2individual/leaflet. Also during the second year there were four depressions recorded on mid July, early September, mid December and finally the fourth one was long depressive perriod started from early February till the end of the year of study which decreased gradually from 5 to 1 individual/leaflet.

The parasitic role of *Pteroptrix aegyptica* as biotic mortality factor influencing *P. blanchardii* population density:

Data presented in Tables (4 and 5) and illustrated in Figs. (5 and 6) clearly showed that, the rate of parasitism of *Pteroptrix aegyptica* had a curve of four generations on 1st August 2012, 1st November, 1st January and mid April 2013 with 1.97, 2.45, 2.62 and 1.83%, respectively. During the second year of study the rate of parasitism highly increased and gave three peaks recorded in mid August, mid November, mid January with 11.66, 44.44 & 18.15% respectively.

On the other hand there were five depressive rate of parasitism recorded on early July (0.17%), early September (0%), mid October (0%), early February (0.25%) and early June (0.15%). In the second year of investigation there were four depressions recorded on mid July (0.84%), mid October (0%), mid December(2.7%) finally the fourth one was long period started from mid April till the end of the year decreased to reach 0.35% These results are agree with, Saad (1980) stated that, in Egypt, *P. blanchardii* was parasitized upon with the two aphelinid parasitoids *Aphytis* sp and *Aspidiotiphagus lounsburii* (Hymenoptera - Aphelinidae) and the parasitism mostly occurred during March, April, June, August and October with 3-4 peaks in

March, April, mid June and August to mid October. Ibrahem (1999) found also that the seasonal rate of parasitism of *Aphytis* sp. on *Parlatoria blanchardii* on date palms at Al-Dhahia locality, Al-Arish region, North Sinai had four peaks per year recorded on mid May, mid August, early November and early December for the first year 1994/1995 and on mid April, mid June, early October and early December during 1995/1996.

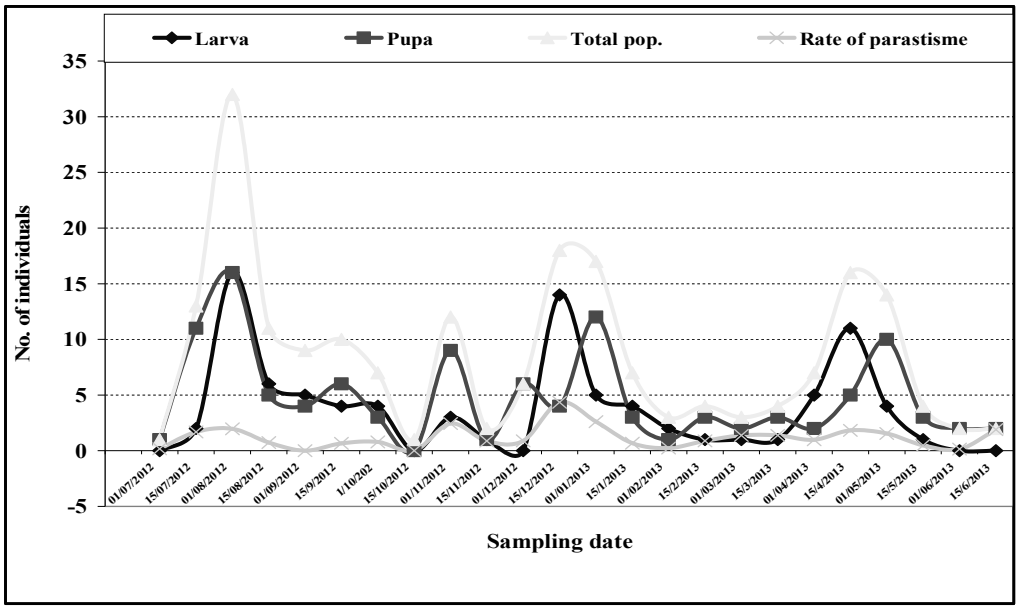

Fig. 5. Seasonal fluctuations of Pteroptrix aegyptica during 2012-2013.

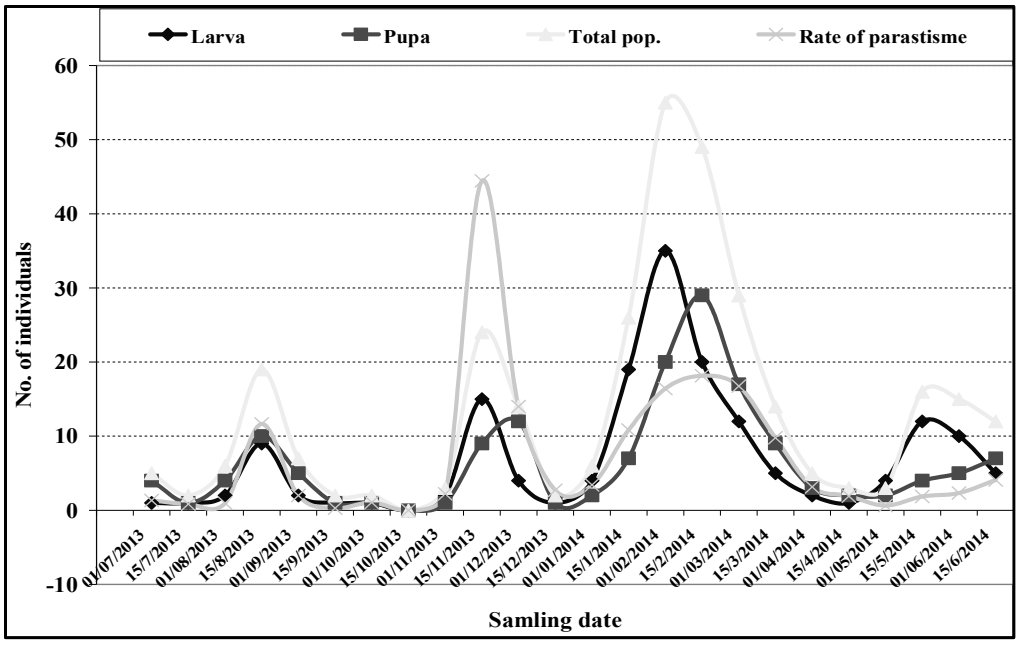

Fig. 6. Seasonal fluctuations of Pteroptrix aegyptica during 2013-2014.

Finally from previous study of the population fluctuations of the date palm pest *Parlatoria blanchardii* and its parasitoid *pteroptrix aegytica* we found that during the first year of investigation the population of the pest was highly increased to reach 19293 insect but the parasitoid population was very low recording 195 per the same year. On the other side during the second year of study, the population of the pest decreased to reach 6477 insect per the second year of study because of the highly increase of the parasitoid population to reach 319 insect for the same year. Accordingly when the population of the parasitoid gives a peak, the population of the pest was low as in the first year of study, or moderate as in the second year of study.

Effect of the climatic factors on *Parlatoria blanchardii* different stages:

The effectiveness of abiotic factors on *P. blanchardii* different stages were studied during two studied years (2012-2013 & 2013-2014) in Qaliobiya governorate as in Tables (4 and 5).

1) Simple correlation: The simple correlation of the different stages of *P. blanchardii* nymph, adult and gravid gave positive highly significant values during the two years of study.

2) Multiple regression: The multiple regression of the different stages showed insignificant effect during the two year of study except the minimum temperature which gave positive significant values on the different stages of *P. blanchardii* during the two years of study.

3) The combined effect of the climatic factors:

The combined effect of climatic factors on the *P. blanchardii* different stages nymph, adult females and gravid females were significant (F = 67.61, 80.62 & 62.09) respectively and the explained variance (E.V.) presented (91.02, 92.36 & 90.3 %) respectively during the first years of study. Also during the second year of study the combined effect of climatic factor on different stages of the same pest were significant (F= 150.47, 43.62 & 28.32) respectively and the explained variance (E. V.) were (95.76, 86.74 & 80.95%) respectively.

Table 2. Results of statistical analysis for simple correlation and multiple regression to investigate the effect of three climatic factors on *P. blanchardii* different stages during the two years of study

Stage	Variable	Simple correlation		Multiple Regression				
		r	P	b	P	F	P	EV
First year (2012-2013)								
Nymph	Tmax	0.75323	0.0001	31.32004	0.0105	67.61	0.0001	91.02
	Tmin	0.9351	0.0001	0.40097	0.0001			
	RH	0.69824	0.0001	-24.9983	0.0166			
Adult	Tmax	0.65786	0.0005	-13.9325	0.039	80.62	0.0001	92.36
	Tmin	0.95023	0.0001	0.29698	0.0001			
	RH	0.67594	0.0003	9.80128	0.0867			
Gravid	Tmax	0.69325	0.0002	-17.44	0.0405	62.09	0.0001	90.3
	Tmin	0.93734	0.0001	0.30205	0.0001			
	RH	0.71972	0.0001	0.30205	0.038			
Second year (2013-2014)								
Nymph	Tmax	0.38063	0.0665	-3.90222	0.397	150.47	0.0001	95.76
	Tmin	0.96744	0.0001	0.63549	0.0001			
	RH	0.45767	0.0245	0.5698	0.8908			
Adult	Tmax	0.48227	0.017	6.00401	0.1026	43.62	0.0001	86.74
	Tmin	0.92034	0.0001	0.26671	0.0001			
	RH	0.5186	0.0094	-5.5952	0.0948			
Gravid	Tmax	0.75692	0.0001	-2.12701	0.5464	28.32	0.0001	80.95
	Tmin	0.78831	0.0001	0.09788	0.0023			
	RH	0.8124	0.0001	5.05419	0.1243			

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التغيرات الموسمية لحشرة النخيل القشرية التى تصيب أشجار النخيل و الطفيل المصاحب لها بتيرو بتركس ايجيبتكا فى محافظة القليوبية

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يصاب النخيل بالعديد من الافات فى محافظة القليوبية من اهمها حشرة النخيل القشرية ، حيث تصيب الحشرة كل أجزاء أشجار خيل البلح و تسبب لها الضعف التام و نقص المحصول كما و كيفا.

تختص الدراسة بدراسة التغيرات الموسمية للافة وتعريف ودراسة الطفيل المصاحب لها خلال عامين متتالين و معرفة الوقت الامثل لمكافحة هذة الافة.

اجريت هذة الدراسة علىاشجار النخيل بمحافظة القليوبية لمدة عامين متتالين (٢٠١٢-٢٠١٣)، (٢٠١٣-٢٠١٤) بغرض دراسة النشاط الموسمى لهذة الافة و عدد أجيالها و مدة كل جيل ودراسة الطفيل المصاحب لها ومعرفة فترات نشاطه و نسبة التطفل على مدار العام، و ايضا دراسة تاثير عوامل الطقس السائدة فى تلك المنطقة على نشاط الحشرة.

أوضحت النتائج أن حشرة النخيل القشرية تتواجد على أشجار النخيل طول العام و لها أربعة أجيال متداخلة فى العام. يبدأ الجيل الأول من أول يوليو حتى أول أكتوبر و مدته من ٣-٣.٥ شهور، الجيل الثنى و يبدأ من منتصف أكتوبر حتى منتصف يناير و مدته ٣.٥-٤ شهور، الجيل الثالث و يبدأ من أول فبراير حتى منتصف ابريل و مدته ٣ شهور و أخيرا لجيل الرابع و يبدأ من منتصف مايو حتى منتصف يونيه و مدته شهرين خلال كل عام من عامى الدراسة.

وجد أن الطفيل المصاحب للافة هو طفيل بتيروبتركس له أربع فترات نشاط فى السنة و كان أعجللى فترة نشاط لها فى فصل الصيف فى العام الاول من الدراسة و فى فصل الشتاء فى العام الثاتى من الدراسة، وس زيادة فى معدل التطفل اربع زيادات فى العام الاول و ثلاث زيادات فى العام الثانى من الدراسة.

تبين من الدراسة ان أعلى ذروة نشاط الحشرة تكون فى فصلى الصيف و الربيع حيث تكون درجتى الحرارة الدنيا و العليا و الرطوبة النسبية عالية و مناسبة لزيادة نشاط الحشرة.

اتضح من نتائج التحليل الاحصائى ان الارتباط البسيط بين(درجات الحرارة الدنيا و العظمى و الرطوبة النسبية) و الاطوار المختلفة للحشرة (الحورية، الاناث البالغة والاناث الواضعة للبيض) أعطى تأثير موجب و عالى المعنوية أما الانحدار المتعدد أعطى تأثير غير معنوى ما عدا فى حالة درجات الحرارة الدنيا أعطت تأثير موجب و عالى المعنوية. كان مقدار التغير فى تعداد الاطوار المختلفة (الحورية، الاناث البالغة و الاناث الواضعة للبيض) الراجع لتأثير عوامل الطقس (الحرارة الدنيا و العظمى و الرطوبة النسبية)٩١.٠٢، ٩٢.٣٦ ، ٩٠.٣% على التوالى فى العام الاول و ٩٥.٧٦، ٨٦.٧٤،% ٨٠.٩٥ فى العام الثانى على التوالى.