Annals of Agric. Sci., Moshtohor **ISSN 1110-0419**
Vol. 53(3) (2015), 433–443 **http://annagricmoshj.com**

Population dynamics of *Fiorinia phoenicis* (Hemiptera-Diaspididae) on date palm at Baharia Oases, Giza governorate, Egypt

I.R.M. El-Zoghby
Plant Prot. Dept., Faculty of Agric. and Natural Resources,
Aswan Univ., Aswan, Egypt

Abstract

The population dynamics of Fiorinia date scale, *Fiorinia phoenicis* (Hemiptera - Diaspididae) was studied for two successive years (2012/2013 and 2013/2014) on date palm cultivated at Baharia Oases, Giza Governorate. The obtained results revealed that, *Fiorinia phoenicis* has three annual field generations on date palm peaked in June/July; September and November in the two years. The longest generation occurred in autumn with duration of 5 months at mean temp. and R.H (21.4ºC & 65.5%R.H. and 22.8ºC & 66.2%R.H.), for the 1st and 2nd year respectively, whereas the shortest one was found in late summer with duration of 3 months at mean temp. and R.H (26.3ºC & 66.0%R.H. and 27.8ºC & 64.8%R.H.), for the 1st and 2nd year respectively. The intermediate generation occurred in early summer with duration of 4 months at mean temp. and R.H (22.8ºC & 63.4%R.H. and 24.9ºC & 63.6%R.H.) for the 1st and 2nd year, respectively.

The generation size varied in the two years, the autumn generation is the largest one (12259.8 & 12153.4 insects), for the 1st and 2nd year respectively, followed by late summer generation (8184.2 & 7430.4 insects), for the 1st and 2nd year respectively), while early summer generation was the lowest one (6688.3 & 7422.1 insects), for the 1st and 2ndyear, respectively.

The population of *F. phoenicis* was found to be distributed at random on the date palm fronds especially the older ones. The cardinal directions of the date palm received similar portions of insect population except for the south direction which received the highest portion of insect population (26.8 & 28%), for the 1st and 2nd year respectively, and become relatively warmer and preferred for infestation than the other side's which received lesser and apparently similar portions of insect population (25.1 , 23.9% & 23.8, 24.3% and 24.3 , 23.8 %), for East, West and North directions (the 1st and 2nd year),respectively.

The distribution of *F. phoenicis* population on the different parts of the date palm leaflets varied, as the middle stratum received the highest portion of insect population (40.0 & 43.4 %) followed by basal stratum (34.3 & 33.3%) and apical stratum (25.7 & 23.3%) for the 1st and 2nd year, respectively.

On the other hand, the insect activity was significantly affected by the daily mean minimum and maximum temperatures as well as % R.H. The changes in the half monthly counts of population, which were affected by the combined effect of these factors, which ranged (61.6 & 72.5% and 59.4 & 66.7%), for nymphs and adults (the 1st and 2nd year, respectively).

So, the annual pruning of date palm and offshoots by removing the infested old fronds (lower fronds) is necessary for reducing the insect population and to save the date palm and dates from infestation by *F. phoenicis* as well as to reduce the chemical control in order to keep the environment free from any contamination with pesticides.

Keywords: Population dynamics, *Fiorinia phoenicis*, date palm.

Introduction

Fiorinia date scale, *Fiorinia phoenicis* Balachowsky, 1967 (Hemiptera: Diaspididae) is an economic important scale insect on date palm (*Phoenix dactylifera* L.). The scale was recorded by Ghabbour and Mohammad (2010) as new pest on date palm in Egypt.

Fiorinia date scale mainly attacks the fronds of the date palm and occasionally the dates; field observation showed that the pinnae of old date palm fronds (lower fronds) were heavily infested with *F. phoenicis* than the new ones. In case of severe infestation the crawlers move to the date bunches and infest the dates during the fruiting season forming thick crusts, making the dates unsuitable for human consumption. The severe infestation greatly affected the growth of date palm specially the offshoots causing yellowish of the pinnae and dryness of the fronds.

In Egypt, some studies were carried out on the bionomics of *F. phoenicis* on date palm at Giza and Qalubyia Governorates (Elwan *et al.*, 2011 and Radwan, 2012) but necessarily further studies are needed on the insect bionomics and its associated natural enemies in other governorates to evaluate the role of natural enemies as biological agents for its control.

Fiorinia phoenicis was recorded in many countries such as Iraq (Hussain, 1974); Saudi Arabia (Matile, 1984); Oman (Elwan, 2000); Iran (Takagi &Moghaddam, 2005); Egypt (Mohammed & Ghabbour, 2008 ; Ghabbour & Mohammad, 2010) and Spain (Seljak & Matile,2012).

The present work was conducted on *F. phoenicis* at Baharia Oases, Giza Governorate to study the bionomics of the scale, its seasonal activity, number and duration of annual field generations, distribution of insect populations on the cardinal directions of date palm fronds as well as on the leaflet stratum besides the effect of main weather factors on its activity under environmental conditions of Baharia Oases, Giza Governorate.

Material and methods

The present work was carried out for two successive years (2012/2013 and 2013/2014) on date palm (Sewy cultivar) cultivated in Baharia Oases, Giza Governorate. The selected date palm received the normal agricultural practices without pruning nor application of any chemical control measure before and during the period of study. Four date palm trees of almost similar age, vegetation and height were randomly selected and sampling was practiced at half monthly intervals. A random sample of 20 leaflets was taken from the cardinal directions of each date palm with rate of 5 leaflets/direction (North, South, East and West), respectively. The collected samples were preserved in paper bags and transferred to the laboratory for inspection with abinocular stereoscopic-microscope. In the laboratory, each leaflet was divided into three equal strata (basal, middle and apical) then the insect population was counted and sorted to nymph and adults in each stratum. The half-monthly means of nymphs and adults population per leaflet were graphically illustrated and the number of annual field generations was determined by integrating of the population curves in these figures. Distributions of insect population on the date palm fronds in the four cardinal directions as well as on the three leaflet stratums were determined. The half monthly means of maximum and minimum temperatures as well as relative humidity were obtained from the Meteorological Central Laboratory, Agricultural Research Center, Dokki, Giza. The obtained weather factors were correlated with the insect population and the simultaneous effect (Fisher, 1950) of the these factors on the variability within the insect population was done by using computer (MSTATC Program) to determine their effect on the insect activity in the two studied years**.**

Results and Discussion

The seasonal activity of *F. phoenicis* was determined for two seasons (2012/2013 and 2013/2014) on date palm cultivated at Baharia Oases, Giza Governorate. The obtained results showed the half-monthly variation in the seasonal activity of the nymph and adult female populations of *F. phoenicis* in both studied years (Figs., 1 & 2). The initial mean count of nymph and adult populations in 1st March ranged 228.9-245.1 nymphs and 127.1-132.6 adults/leaflet for the 1st and 2nd year respectively. These counts increased gradually in April and May. The insect population increased greatly during June and July in the two years recording the1st peak for insect activity in mid-June in the 1st year and 1st July in the 2nd one (695-765.3 nymphs and 447-501.2 adults/leaflet), for the 1st and 2nd year respectively at field conditions 25.2-26.0ºC and 63.8-63.9% R.H., respectively.

The insect population showed gradual decrease in July 2nd in the two years followed by gradual increase by late August and high increases during September in the two years, respectively. In early and mid-September, the insect population reached the 2nd peak in the 2nd and 1st year with mean population ranged 931.1-1026.9 nymphs/leaflet and 584.5-621.0 adults/leaflet at 27.7-28.6ºC and 62.6-66.4% R.H., respectively.

The population decreased in the 1st half of October then increased again through the 2nd half of October in the two years. The insect activity reached its maximum during November in the two years recording 3rd peak by early November in the 1st year and mid-November in the 2nd one (1300.6 - 1450.8 nymphs/leaflet and 907.0-914.7 adults/leaflet)at 21.7 -23.9ºC and 62.6-66.4% R.H., respectively.

During December, the insect population showed gradual decrease of the nymph and adult populations in the two years. This decrease continued during January and February until reaching 176.0 - 190.4 nymphs/leaflet and 211.0-295.1 adults/leaflet by mid-February at 14.3-14.5ºC and 62.0-63.3% R.H.

According to the above-mentioned results, *F. phoenicis* has three annual peaks per year under field conditions of Baharia Oases, Giza Governorate. The annual peaks occurred in June/July, September and November in the two years of study. So, the annual pruning of date palm and offshoots by removing the infested old fronds are necessary for reducing the insect population to the minimum in order to save the date palm and dates from infestation with *F. phoenicis* and to avoid application of chemical control and subsequently keep environment free from any contamination with pesticides.

In agreement with the present results, Elwan *et al.* (2011) recorded three annual peaks a year for *F. phoenicis* on date palm in Giza governorate, Egypt. Those appeared in early June, around August/September and October/November, whereas Radwan (2012) reported two periods of seasonal activity for *F. phoenicis* population (nymphal and adult stages) per year on date palm in Qalubyia Governorate.

The 1st period of nymphal activity occurred in autumn, peaked in early December and the 2nd period occurred in summer season peaked in early July.

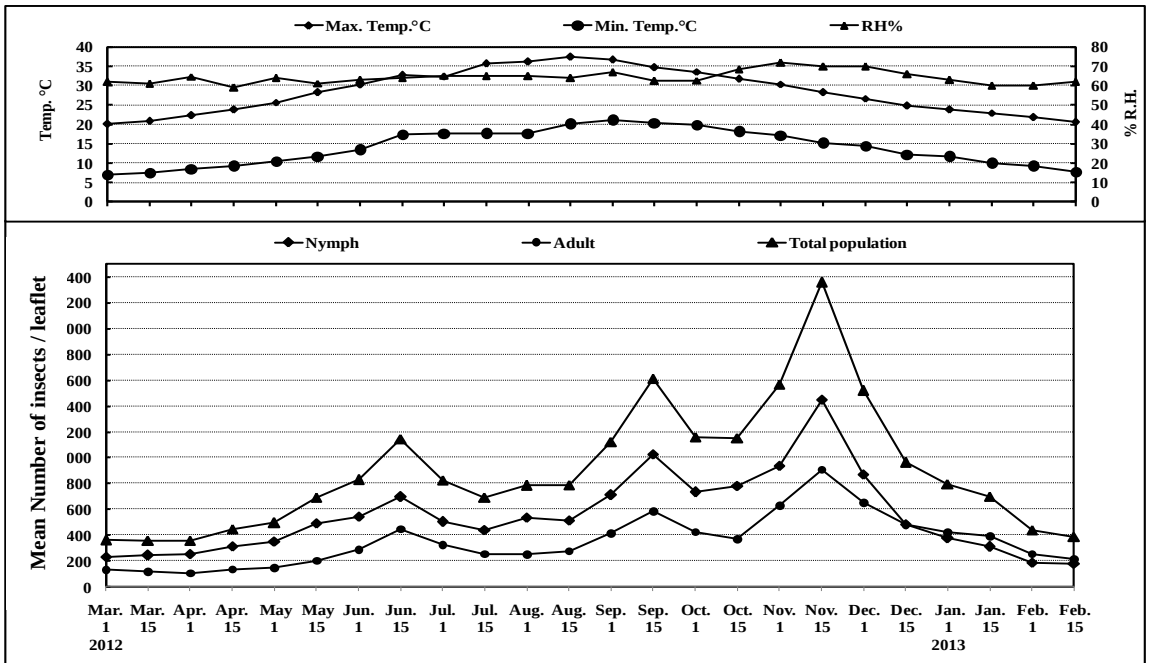

Fig. (1): Population dynamics of *F. phoenicis* on leaflets of the date palm fronds in response to daily mean weather factors at Bahria Oases, Giza Governorate in the 1st year (2012/2013)

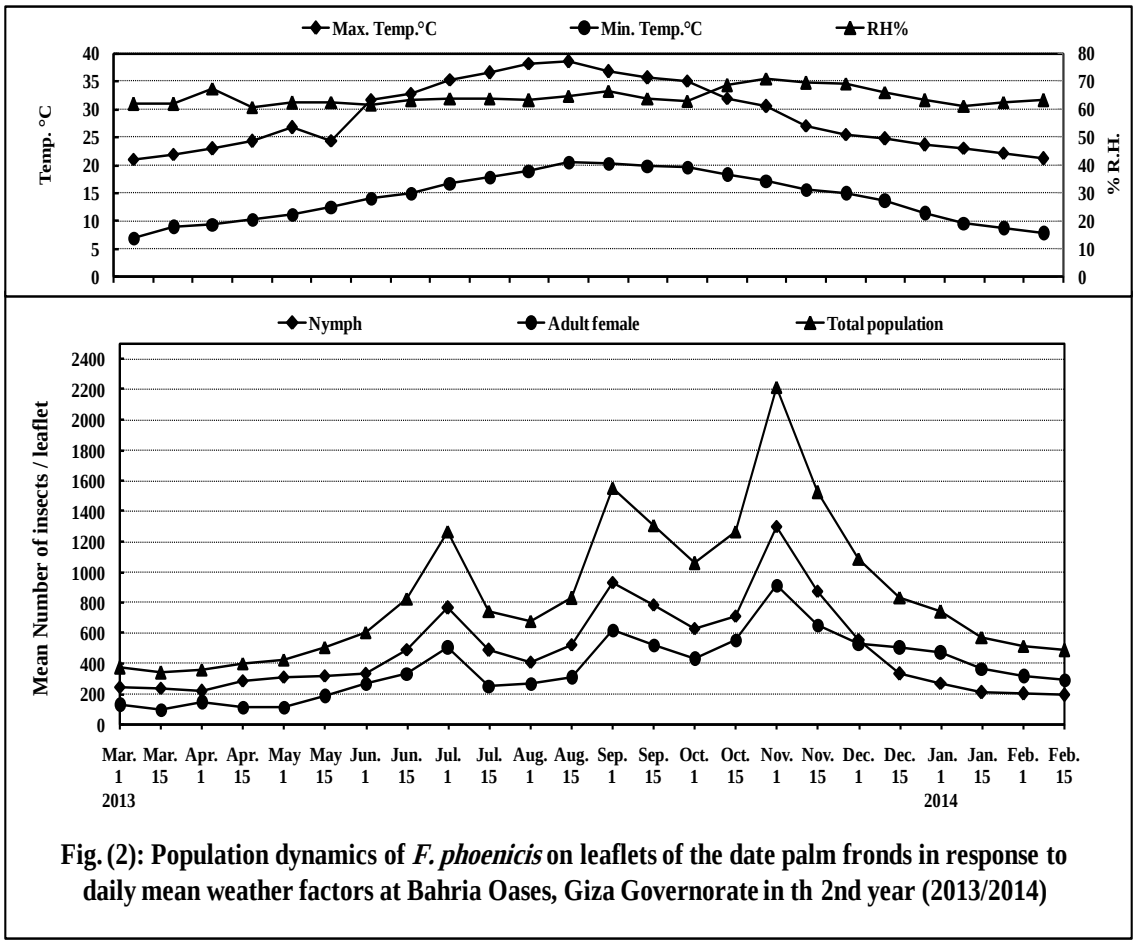

Fig. (2): Population dynamics of *F. phoenicis* on leaflets of the date palm fronds in response to daily mean weather factors at Bahria Oases, Giza Governorate in th 2nd year (2013/2014)

The 1st period of adult activity appeared during autumn-winter seasons with one peak in early February and the 2nd period appeared during summer season peaked in early July.

Number and durations of annual field generations of *F. phoenicis*

Number and duration of annual field generations of *F. phoenicis* were determined by integrating the population curves in each generation (Table1,2 & Fig.,3).The obtained results may be discussed as follows:

1- The 1st generation (early summer)

The 1st generation started from mid-April to mid-August peaked in mid-June (695 nymphs / leaflet) in the 1st year at 22.9ºC & 63.9%R.H. whereas in the 2nd year, it appeared from early May to early September peaked in first July(765.3 nymphs/leaflet) at 26.0ºC & 63.8%R.H.

2- The 2nd generation (Late summer)

The 2nd generation appeared from early August and extended to early November peaked in mid-September (1026.9 nymphs/leaflet) in the 1st year at 27.7ºC & 62.6%R.H., while in the 2nd year, it occurred from mid-July to mid-October peaked in first September (931.0 nymphs/leaflet) at 28.6ºC & 66.4%R.H.

3- The 3rd generation (Autumn)

The 3rd generation occurred between mid-September and mid-February peaked in mid-November (1450.8 nymphs/leaflet) in the 1st year at 21.7ºC & 70% R.H., whereas in the 2nd year, it started from September 1st and continued until late January, peaked in 1st November (1300 nymphs/leaflet) at field conditions of 23.9ºC & 71.2 % R.H.

The obtained results revealed that, the 1st generation of *F. phoenicis* lasted for four months with population of 4370.0 & 4567.7 nymphs/leaflet and 2318.3 & 2854.4 adults/leaflet at 22.8ºC & 63.4 % R.H. and 24.9ºC & 63.6%R.H., for the 1st and 2nd year, respectively. The 2nd generation extended for three months with population of 4472.5 & 5231.1 nymphs/leaflet and 2953.1 & 2957.9 adults/leaflet at 26.3ºC & 66.0%R.H. and 27.8ºC & 64.8%R.H., for the 1st and 2nd year, respectively. The 3rd generation extended for five months with population of 6591.5 & 7146.7 nymphs/leaflet and 5113.1 & 5561.9 adults/leaflet at 21.4ºC & 65.5%R.H. and 22.8ºC & 66.2%R.H., for the 1st and 2nd year, respectively.

The shortest generation occurred in late summer in the two years, with duration of 3 months at field conditions of 26.3ºC & 66.0%R.H. and 27.8ºC & 64.8%R.H., for the 1st and 2nd year, respectively. The longest generation occurred in autumn with duration of 5 months at 21.4ºC & 65.5% R.H. and 22.8ºC & 66.2% R.H., for the 1st and 2nd year, respectively, followed by intermediate generation occurred in early summer with duration of 4 months in the two years at 22.8ºC & 63.6% R.H. and 24.9ºC & 63.4% R.H. for the 1st and 2nd year, respectively.

On the other hand, the generation size varied in the two years, the autumn generation is the largest one (12259.8 & 12153.4 insects/leaflet) for the 1st and 2nd year, respectively, followed by late summer generation size (8184.2 & 7430.4 insects/leaflet), for the 1st and 2nd year, respectively. Early summer generation size (6688.3 & 7422.1 insects/leaflet), for the 1st and 2nd year, respectively.

Table 1. Number and durations of annual field generations of *F. phoenicis* on date palm at Baharia Oases, Giza Governorate in the 1st year (2012/2013).

Generation	Generation duration			Duration (month)	Generation size			Mean daily weather factors			
	From	To	Peak		Nymph	Adult	Total population	Max. Temp °C	Min. Temp. °C	Mean Temp. °C	% RH
1st Generation (Early summer)	**Mid April**	**Mid Aug.**	**Mid-June**	**4**	**4370.0**	**2318.3**	**6688.3**	**31.1**	**14.5**	**22.8**	**63.4**
2nd Generation (Late summer)	**1st Aug.**	**1st Nov.**	**Mid-Sep.**	**3**	**5231.1**	**2953.1**	**8184.2**	**33.4**	**19.2**	**26.3**	**66.0**
3rd Generation (Autumn season)	**Mid-Sep.**	**Mid Feb.**	**Mid Nov.**	**5**	**7146.7**	**5113.1**	**12259.8**	**27.9**	**14.8**	**21.4**	**65.5**

Table 2. Number and durations of annual field generations of *F. phoenicis* on date palm at Baharia Oases, Giza Governorate in the 2nd year (2013/2014).

Generation	Generation duration			Duration (month)	Generation size			Mean daily weather factors			
	From	To	Peak		Nymph	Adult	Total population	Max. Temp. °C	Min. Temp. °C	Mean Temp. °C	% RH
1st Generation (Early summer)	1st May	1st Sep.	1st Jul.	4	4567.7	2854.4	7422.1	33.4	16.4	24.9	63.6
2nd Generation (Late summer)	Mid Jul.	Mid Oct.	1st Sep.	3	4472.5	2957.9	7430.4	36.1	19.4	27.8	64.8
3rd Generation (Autumn season)	1st Sep.	Late Jan.	1st Nov.	5	6591.5	5561.9	12153.4	29.4	16.1	22.8	66.2

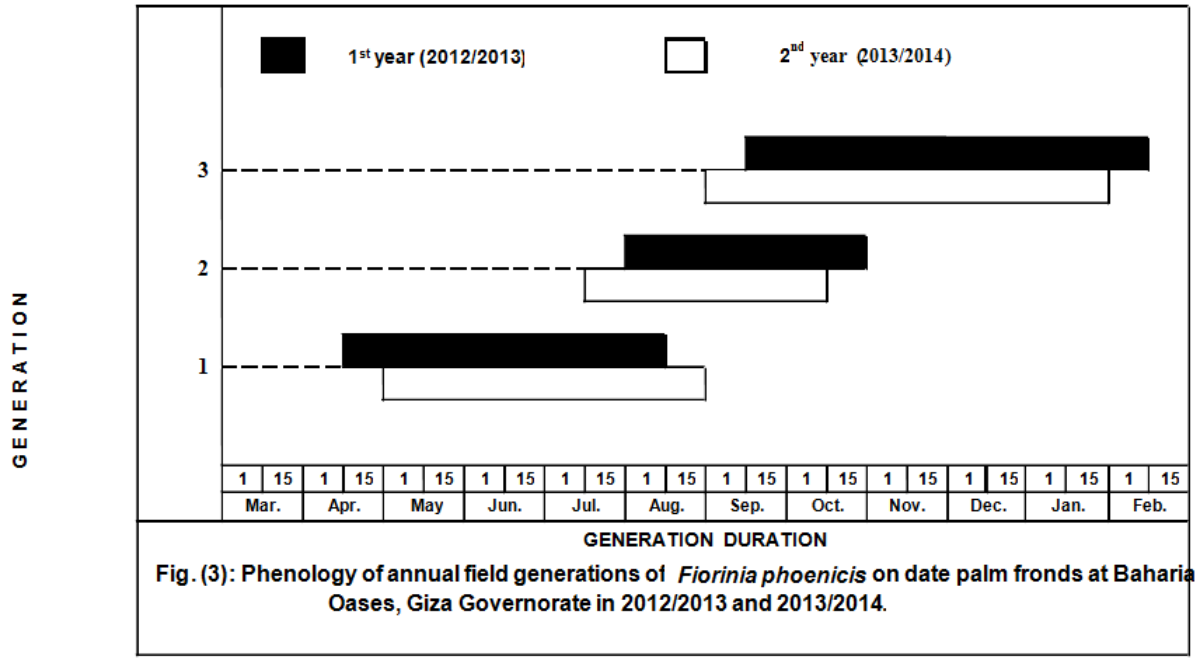

Fig. (3): Phenology of annual field generations of *Fiorinia phoenicis* on date palm fronds at Baharia Oases, Giza Governorate in 2012/2013 and 2013/2014.

In Egypt, Elwan *et al.* (2011) pointed out that, *Fiorinia phoenicis* occurred on date palm fronds all the year round and has three overlapping generations a year on date palm at Giza governorate. The 1st generation (early summer generation) peaked in early June and the 2nd generation (late summer generation) peaked around August/September, whereas the 3rd generation (autumn generation) peaked in October/November. The shortest generation was the late summer generation (2.5-3.0 months) at 27.9-28.6ºC and 63.5-64.8%R.H., whereas the longest one was autumn generation (4.5 months) at 21.6-22.0ºC and 65.9-66.3%R.H. The early summer generation had intermediate duration (4.0-4.5 months) at 20.9-21.2ºC and 62.5-63.0% R.H in the two years, respectively. The population density varied in the three generations, the autumn generation was the largest one followed by late summer generation whereas the smallest one was the early summer generation.

Cardinal distribution of *F. phoenicis* population on date palm fronds.

The cardinal distribution of *F. phoenicis* population on the date palm fronds varied significantly in the four cardinal directions (Table, 3 & Figs., 4, 5) in the two years, respectively. In the 1st year, the southern direction received the highest portion of insect population (240.3 insects/leaflet), followed descendingly by eastern direction (225.1 insects/leaflet), Northern direction (218.3 insects/leaflet), and west direction (213 insects/leaflet), respectively without significant differences between each other.

In the 2nd year, the cardinal distribution of insect population on the date palm fronds had the

same manner. The south direction received the highest population (247.9 insects/leaflet), followed by west, east and north directions (215.3, 211.6 and 211.3 insects/leaflet), respectively, without significant difference between means.

It could be observed that, the distribution of insect population on the date palm fronds in the cardinal directions was similar in the two years expect south direction. During the 1st year, the south direction received the highest portion of insect population (26.8%) followed by east (25.1%), north (24.9%) and west (23.8%) directions, respectively. In the 2nd year, the south direction received the highest portion of insect population (28%) followed by west (24.3%), east (23.9%) and north (23.8%) directions, respectively.

Table 3. Cardinal distribution of F. *phoenicis* population on date palm fronds at Baharia Oases, Giza Governorate in 2012/2013 and 2013/2014**.**

Direction	Mean number of insect population /direction			
	1st year (2012/2013)	%	2nd year (2013/2014)	%
North	218.3 (bc)	24.3	211.3 (b)	23.8
South	240.3 (a)	26.8	247.9 (a)	28.0
East	225.1 (b)	25.1	211.6 (b)	23.9
West	213.0 (c)	23.8	215.3 (b)	24.3
Total	896.7	100.0	886.1	100.0
F value	14.0**		4.9**	
LSD at 5%	8.9		22.6	

The obtained results indicated that, the south direction received the highest portion of insect population in the two years, respectively. So, it may be concluded that, *F. phoenicis* prefers to accumulate at the southern sides of the date palm trees, usually being relatively warmer than the other sides and become more preferred for infestation than the other sides which received almost similar populations.

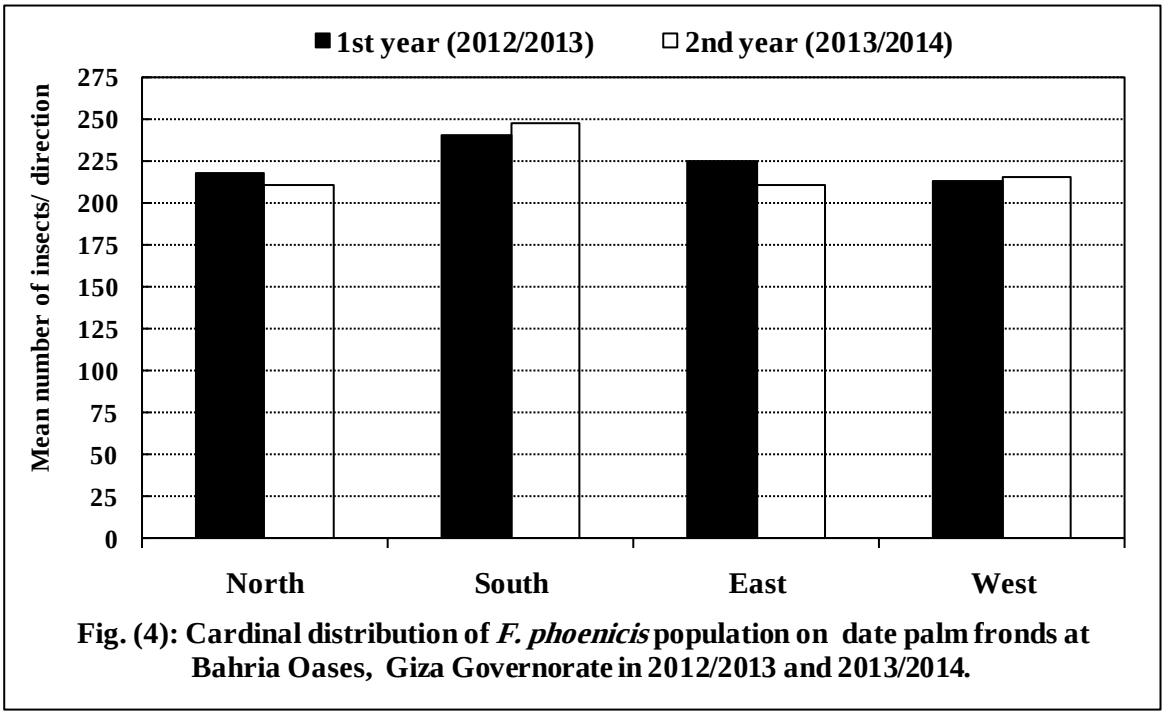

Fig. (4): Cardinal distribution of *F. phoenicis* population on date palm fronds at Bahria Oases, Giza Governorate in 2012/2013 and 2013/2014.

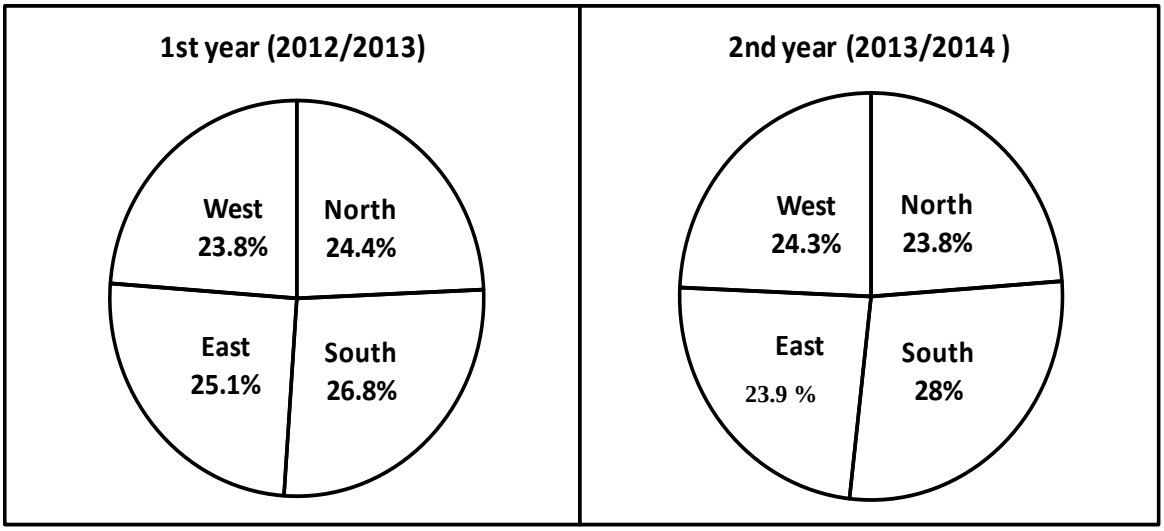

Fig. (5): Relative distribution of *F. phoenicis* population on the cardinal directionsof date palm fronds at Baharia Oases, Giza Governorate in 2012/2013 and 2013/2014.

Distribution of insect population on the different parts of the date palm leaflets

The distribution of *F. phoenicis* population on the different parts of the date palm leaflets (Table, 4 & Figs., 6, 7) varied significantly in the two years. During the 1st year, the middle stratum received the highest portion of insect population (358.6 insects/leaflet), followed by basal stratum (308.0 insects/leaflet), being in the 2nd order, whereas the apical stratum received the lowest portion (230.6 insect/leaflet) of insect population and came in the last order.

In the 2nd year, the distribution of *F. phoenicis* population had the same trend. The middle stratum received the highest portion of insect population (370 insects/leaflet), followed by basal stratum (284.6 insects/leaflet) being in the 2nd order, whereas apical stratum received the lowest portion of insect population (199.2 insects/leaflet).

The obtained results (Table, 4) stated that, the middle stratum of date palm leaflets received the highest portion of insect population (40-43.4%) followed by basal stratum (33.3-34.3%) and apical stratum received the lowest population (23.3-25.7%) in the two years of study.

Data of the present investigation agree with Elwan *et al.* (2011) who found that basal stratum of date palm leaflets, at Giza governorate, Egypt, received the highest infestation (37.4-38.3%) with the *F. phoenicis* than middle (34.4-35.3%) and apical ones (26.4-28.2%). On the other hand, Radwan (2012) showed that, the insect population of *F. Phoenicis* was significantly distributed on date palm leaflets at Qalubyia Goverorate,the middle stratum received the highest number of insects followed by apical and basal stratum , repectively.

Table 4. Distribution of *F. phoenicis* population on the different strata of the date palm leaflets at Baharia Oases, Giza Governorate in 2012/2013 and 2013/2014.

Stratum	Mean number of insect population / stratum			
	1st year (2012/2013)	%	2nd year (2013/2014)	%
Apical stratum	**230.6 (c)**	**25.7%**	**199.2 (c)**	**23.3%**
Middle stratum	**358.6 (a)**	**40.0%**	**370.0 (a)**	**43.4%**
Basal stratum	**308.0 (b)**	**34.3%**	**284.6 (b)**	**33.3%**
Total population	**897.2**	**100**	**853.8**	**100**
F value	**79.2****		**78.3****	
LSD at 5%	**20.6**		**27.5**	

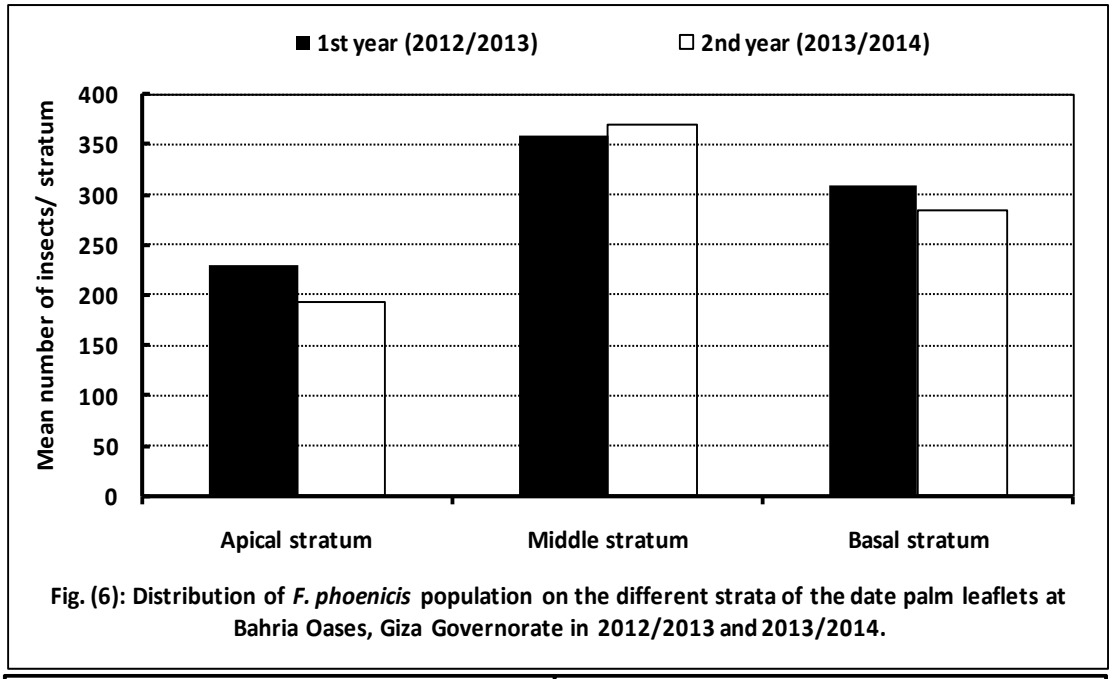

Fig. (6): Distribution of *F. phoenicis* population on the different strata of the date palm leaflets at Bahria Oases, Giza Governorate in 2012/2013 and 2013/2014.

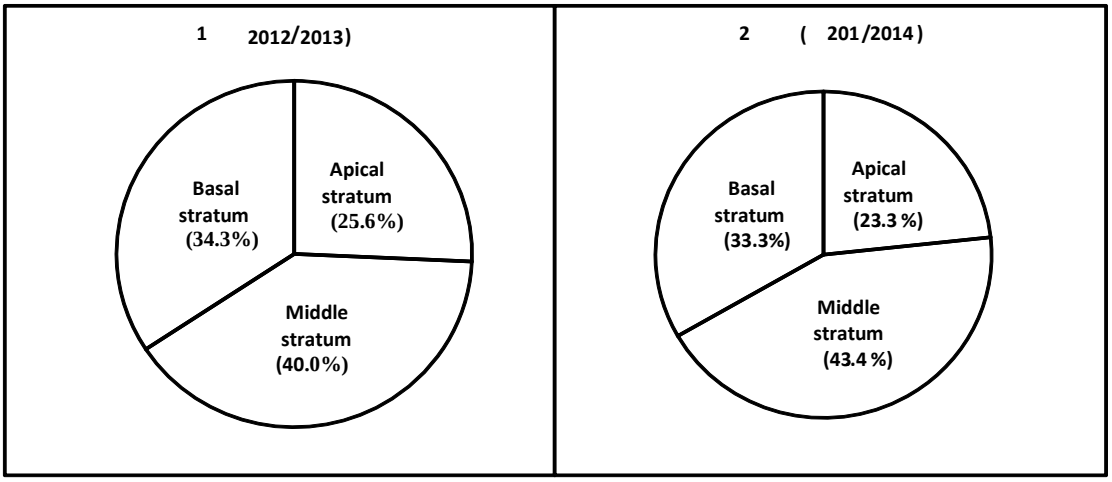

Fig. (7): Relative distribution of *F. phoenicis* population on different strata of the date palm leaflets at Baharia Oases, Giza Governorate in 2012/2013 and 2013/2014.

Effect of weather factors on the seasonal activity of *F. phoenicis*

A- Nymphal population

1- Effect of daily mean minimum temperature

The obtained results (Table, 5) showed highly significantly positive response (r = 0.673 & 0.732) for daily mean minimum temperature on the nymphal activity in the two years. The effect of daily mean minimum temperature was positive (P. reg. values = 99.9 &28.5) on the nymphal activity in the two years being highly significant in the 1st year and non significant in the 2ndone.

2- Effect of daily mean maximum temperature

Daily mean maximum temperature showed highly significantly positive relation (r values =0.534 & 0.581) on the nymphal activity in the two years (Table 5).The effect of this factor was nonsignificant (P. reg. values = -49.2 & 4.5) in the two years being negative in the 1st year and positive in the 2nd one (Table, 5).

3- Effect of daily mean relative humidity (%R.H.)

Relative humidity (% R.H.) had positive effect on nymphal activity (r values = 0.490 & 696) being significant in the 1st year and highly significant in the 2nd one. The effect of % R.H. on the nymphal activity was positively non-significant in the 1st year and highly significant in the 2nd year (P. reg. values = 18.7 & 50.2), (Table,5).

4-Combined effect of the tested weather factors on the nymphal activity

The obtained results (Table, 5) showed that, the combined effect of the tested weather factors on the nymphal activity was highly significant (F values = 10.7 & 17.6) in both years of study, respectively. The changes in the half monthly counts of the nymphal population may be attributed to the effect of the

tested weather factors that ranged from 61.6-72.5%. The forementioned results emphasized that, the effects of these factors varied from year to year and daily mean minimum temperature and %R.H. have a detectable effect on the nymphalactivity of *F. phoenicis*

Table 5. Effect of tested weather factors on *F. phoenicis* population on date palm at Baharia Oases, Giza Governorate in2012/2013 and 2013/2014.

Insect population	Weather Factor	1st year (2012/2013)					2nd year (2013/2014)				
		Simple correlation	Partial regression values		ANOVA T		Simple correlation	Partial regression values		ANOVA T	
		r	P. reg. ± s.e	t value	F value	E.V. %	r	P. reg. ± s.e	t value	F value	E.V. %
Nymph	Min.Temp.°C	0.673**	99.9±32.7	3.10**	10.7**	61.6	0.732**	28.5±9.1	0.98	17.6**	72.5
	Max. Temp.°C	0.534**	-49.2±25.5	-1.9			0.581**	4.5±1.9	0.23		
	% R.H.	0.490*	18.7±11.7	1.6			0.696**	50.2±16.9	3.0**		
Adult	Min.Temp.°C	0.505*	91.3±21.6	4.2**	9.8**	59.4	0.553**	44.4±22.9	1.9	13.3**	66.7
	Max. Temp.°C	0.304	-59.7±16.8	-3.6**			0.324	-21.3±15.4	-1.4		
	% R.H.	0.426*	7.8±5.7	1.01			0.748**	32.8±13.3	2.5**		
Total population	Min.Temp.°C	0.624**	191.2±51.8	3.7**	10.9**	62.1	0.684**	72.9±35.3	1.54	18.4**	73.4
	Max. Temp.°C	0.457*	-108.9±40.4	-2.7**			0.493*	-16.8±9.2	-0.5		
	% R.H.	0.478*	26.5±18.6	1.43			0.747**	83.0±27.4	3.03**		

B -Adult population

1- Effect of daily mean minimum temperature

Daily mean minimum temperature showed positive relation with adult`s activity in the two years (Table, 5), being significant in the 1st year (r value =0.505) and highly significant (r value = 0.553) in the 2ndone. The effect of this factor was positive (P. reg. values = 91.3 & 44.4) on the adult activity in the two years of study, being highly significant in the 1styear and non-significant in the 2ndone.

2- Effect of daily mean maximum temperature

Daily mean maximum temperature showed positive non-significant response on *F. phoenicis* activity (r values = 0.304 & 0.324) in the two years, respectively. The effect was negatively (P. reg. = -59.7&-21.3) in the two years, being highly significant in the 1st year and nonsignificant in the 2nd one (Table, 5).

3- Effect of daily mean relative humidity (%R.H.)

Daily mean relative humidity (%R.H.) had positive effect on the adult population in the two years, being significant in the 1st year and highly significant in the 2ndone. The effect of %R.H. on the adult activity was positively non-significant (P. reg. values=7.5 & 32.8) in the 1st year and highly significant in the 2nd year (Table, 5).

4-Combined effect of the tested weather factors on the adult population

The combined effect of the tested weather factors on the adult population of *F. phoenicis* was highly significant (F values = 9.8 & 13.3) in both years, (Table, 5). The changes in the half monthly counts of the adult population indicated that the effect of tested weather factors ranged 59.4-66.7%.

C - Total population

1- Effect of daily mean minimum temperature

Daily mean minimum temperature significantly correlated with the insect population in the two years(r values =0.624&0.684). The effect of this factor on the insect activity was positive in the two years (P. reg. values = 191.2 & 72.9 insects / leaf), being highly significant in the 1st year and non-significant in the 2nd one (Table, 5).

2- Effect of daily mean maximum temperature

Daily mean maximum temperature showed significantly positive effect on the *F. phoenicis* population in the two years, whereas, its effect was negative in the two years (P. reg. values = -108.9 & -16.8), being highly significant in the 1st year and nonsignificant in the 2nd one (Table, 5)

3- Effect of daily mean relative humidity (%R.H.)

Daily mean relative humidity has significant positive effect on the insect population (r = 0.478) in the 1st year and highly significant (r = 0.747) in the 2ndone, while the effect of %R.H. on activity was positive in the two years (P. reg. values = 26.5 & 83.0), being nonsignificant in the 1st year and highly significant in the 2nd one (Table, 5).

4- Combined effect of the tested weather factors on the insect population

The combined effect of the tested weather factors on the *F. phoenicis* activity was highly significant (F values = 10.9 & 18.4) in two the years of study (Table, 5). The changes in the half monthly

counts of the insect population may be referred to the effect of the tested weather factors ranged 62.1 and 73.4%, respectively.

In Egypt, Elwan *et al.* (2011) stated that, the annual field generations of *F. phoenicis* on date palm at Giza Governorate was greatly affected by the daily mean temperature and %R.H. The changes in the half monthly counts of the nymph and adult populations could be referred to combined effect of these weather factors ranged 66.1-69% & 48.1-49.2% for the 1st generation (early summer generation); 65.4-74.0% & 63.8-78.4%in the 2nd generation (late summer generation)and 60.9-77.4% & 48.6-63.5% in the 3rd generation (autumn generation) in the two years, respectively. While in similar studies, Radwan (2012) showed that, the durations of seasonal activity of *F. phoenicis* nymphs and adults were significantly affected with daily mean max. and min. temperatures as well as %R.H. The combined effect of these factors on the nymphal activity ranged 58.2-74.8% in the 1st period of activity and 66.9-74.8 in the 2nd one in the two years whereas the combined effect of these factors on the adult activity ranged 53.9-76.3% in the 1st period and 84.9-87.9% in the 2nd one for the two years, respectively.

References

Balachowsky, A. S. (1967): Une espèce nouvelle de Fiorinia (Coccoidea - Diaspidini) vivant surpalmeir-dattierdans les Oasis du sud de l`lran.*Ann. Soc. Ent. France, 3*: 771-775.

Elwan, E. A. (2000): Survey of the insect and mite pests associated with date palm trees in Al-Dakhliya Region, Sultanate of Oman. *Egypt. J. Agric. Res., 78(2)*:653-664.

Elwan, E. A.; I. E. Maha and A. M. Serag(2011): Seasonal activity of fiorinia date scale, *Fiorinia phoenicis* Balachowsky (Hemiptera - Diaspididae) on date palm at Giza Governorate, Egypt. Egypt. *J. Agric. Res*.; *89(2)*:549 – 565.

Fisher, A. R. (1950): Statistical methods for research worker. Oliver and Boyd, Edinburgh and London.

Ghabbour, M.W. and Z.K. Mohammad (2010): *Fiorinia phoenicis* (Hemiptera: Coccoidea: Diaspididae) new pest of palm trees in Egypt. *J. Egypt. Ger. Soc. Zool., 58(E)*: 15-20.

Hussain, A. A. (1974): Date palms and dates with their pests in Iraq. Univ. Baghdad, Ministry of Higher Educ. Sci. Res. Baghdad, 244 pp.

Matile, F. D. (1984): Insects of Saudi Arabia Homoptera: Suborder Coccoidea. *Fauna of Saudi Arabia, 6* : 219-228.

Mohammed, Z.K. and M.W. Ghabbour (2008): Updating list of super family Coccoidea (Hemiptera) as known to exist in Egypt. 18th International Conference of the Egyptian German society of Zoology, 1-5 March 2008, Faculty of Girls, Ain Shams University.

Radwan, S. G. (2012): Seasonal fluctuation of fiorinia date scale, *Fiorinia phoenicis* Balachowsky(Hemiptera-Diaspididae) populations on date palm trees at Qalubyia Governorate, *Egypt. Journal of Basic & Applied Zoology, 65*: 47-54.

Seljak, G. and F. D. Matile(2012): First record of *Fioriniaphoenicis*Balachowsky, 1967, in Europe (Hemiptera, Diaspididae). *Bulletin de la Société Entomologique de France , 117(4)*: 453-455.

Takagi, S. and M. Moghaddam (2005): New or noteworthy armored scale insects occurring in Iran (Homoptera: Coccoidea: Diaspididae). *Ins. Matsum. n. s. 61*:43-74.

ديناميكية تعداد حشـــرة فيورينيا النخيل القشرية *Fiorinia phoenicis* على نخـيل البلح فى الواحات البحرية ، محافظة الجيزة – مصر

إسلام راشد مرزوق الزغبى
كلية الزراعة والموارد الطبيعية –جامعة أسوان – أسوان – مصر

حشرة فيورينيا النخيل القشرية *Fiorinia phoenicis* من الآفات الحشرية الهامة التى تصيب نخيل البلح فى مصر حيث تسبب الاصابة الشديدة اصفرار الخوص وجفاف السعف وتشوة الثمار. اجريت الدراسة الحالية لمدة عامين متتاليين (2013/2014 – 2012/2013)فى الواحات البحرية بمحافظة الجيزة بغرض دراسة ديناميكية تعداد الحشرة على نخيل البلح ونشاطها الموسمى ، وتحديد عدد أجيالها ، ودراسة توزيع تعداد الحشرة على سعف النخيل فى الاتجاهات المختلفة من النخلة وعلى الأجزاء المختلفة من الخوصة بالاضافة الى دراسة تأثيرعوامل المناخ السائدة فى منطقة الدراسة على نشاط الحشرة الموسمى حتى يمكن وضع برنامج متكامل لمكافحتها والحد من انتشارها والحصول على ثمار جيدة خالية من الإصابة الحشرية.

اتضح من النتائج وجود ثلاثة اجيال متداخلة للحشرة على مدار العام ، ظهرت قمم نشاطها فيونيو/ يوليو ، سبتمبر ونوفمبر فى العامين على التوالى . وكان جيل الخريف (الجيل الثالث) أطول الاجيال مدة حيث امتد نشاطة الى خمسة شهور فى كلا العامين على درجة حرارة(21.4& 22.8م°) ورطوبة نسبية (66.265.5 &%) في كلا العامين على التوالى،وكان أقصرها مدة هو الجيل الثانى الذى ظهر فى نهاية الصيف وكانت فترة نشاطة ثلاثة شهورعلى درجة حرارة (26.3&27.8م°) ورطوبة نسبية (66.0&64.8 %) في كلا العامين على التوالى، وظهر الجيل الاول فى بداية الصيف وفترة نشاطه أربعة أشهرعلى درجة حرارة (22.8&24.9م°) ورطوبة نسبية (63.4& 63.6%) في كلا العامين على التوالى. كما وجد تباين واضح فى حجم الأجيال الثلاثة فكان جيل الخريف أكثر الأجيال حجما حيث وصل اجمالي تعداد الحشرة(حوريات وحشرات كاملة) الى (12259.8& 12153.4 حشرة)ثم جيل الصيف المتأخر (8184.2&7430.4 حشرة) وأخيرا جيل الصيف المبكر (6688.3 & 7422.1 حشرة) في كلا العامين على التوالى.

وتبين من الدراسة تواجد أطوار الحشرة على سعف النخيل على مدار العام وخاصة الأجزاء السفلية للسعف (السعف القديم) ويتوزع تعدادها (حوريات وحشرات كاملة) عشوائيا على السعف فى الاتجاهات المختلفة عدا الاتجاه الجنوبى حيث احتل المركز الاول (26.8 – 28.0%)من تعداد الحشرة في كلا العامين على التوالى ، وهذا راجع الى دفء هذا الجانب عن جوانب النخلة الاخرى (الشرق ، الغرب والشمال) والتى نالت تعداداأقل ومتقارب من اطوار الحشرة وبدون فروق معنوية بينهما حيث بلغت (25.1 ,22.9 % & 23.8 و 24.3% و 24.4،23.8 %) للاتجاه الشرقى والغربى والشمالى في كلا العامين على التوالى.

كما وجد تباين واضح فى درجة انتشار الحشرة على الخوص حيثوجدت اعداد كثيرة من اطوار الحشرة على الثلث الوسطى من الخوصة (40.0 &43.4%) ثم انخفض التعداد على الثلث السفلى (34.3& 33.3%) وأقل بدرجة كبيرة على الثلث الطرفى من الخوصة (25.7& 23.3%) فى كلا العامين على التوالى.

كما تأثرنشاط الحشرة بالظروف الجوية السائدة (درجة الحرارة العظمى والدنيا والرطوبة النسبية) فى منطقة الدراسة فى كلا العامين ،وكان التاثير المشترك للعوامل الثلاثة متباينا على نشاط طورى الحورية والحشرة الكاملة حيث تراوح فى طور الحورية (61.6& 72.5%) وطور الحشرة الكاملة (59.4& 66.7%) فكلا العامين على التوالى. وتبين من المشاهدات الحقلية ان التقليم السنوى لنخيل البلح والفسائل كان له دورواضح فى خفض تعداد الحشرة بدرجة كبيرة على السعف الجديد والثمار فى الموسم التالى مع تجنب استخدام المبيدات فى المكافحة بهدف الحفاظ على البيئة من التلوث .