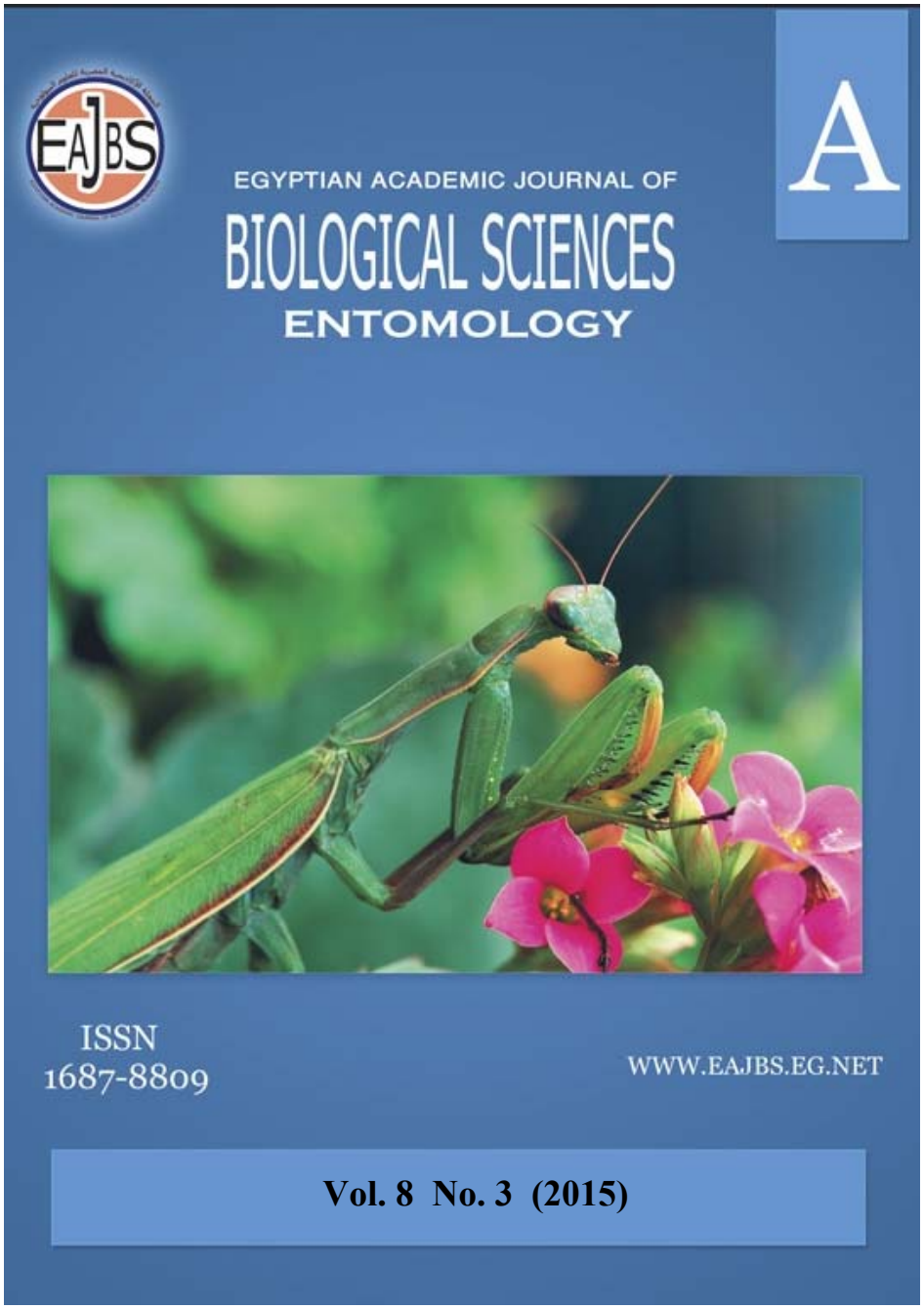

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Population Dynamics of Fiorinia Date Scale, *Fiorinia phoenicis* (Hemiptera: Diaspididae) on Date Palm Variety, Barhyin Sharkyia Governorate, Egypt.

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ABSTRACT

The present study was carried out throughout two successive years (2013–2014) in Sharkyia Governorate to determine the seasonal activity of fiorinia date scale, *Fiorinia phoenicis* Balachowsky (Hemiptera: Diaspididae) on date palm variety Barhy. The obtained results showed that, both nymphal and adult stages have three periods of seasonal activity per year. The periods of nymphal activity peaked in mid June, mid September and mid November in both years, respectively. On the other hand the periods of adult female activity were in early June and early September for first and second generations but it was in mid November and early October for the third generation, respectively. The duration of seasonal activity for both nymphal and adult stages was affected significantly with the tested weather factors (daily mean temperatures and % RH). The combined effect of the tested weather factors on the population activity ranged 71.2& 63.4% in the 1st period of activity and 59.9& 69.7% in the 2nd one, while ranged 70.2 & 58.9% in the 3rd period for the 2 years, respectively.

INTRODUCTION

The date palm tree, *Phoenix dactylifera* L. is one of the most famous species of family Palmaceae. Date palm considered as one of the most popular fruits in Egypt and its products are considered as raw materials for some industries. Date palm trees are attacked by many agricultural pests, which cause considerable reduction in quality andquantity of dates fruit yield Hussain (1974).In Egypt, it is attacked by some scale insect and mealybug especially, parlatoria date scale, *Parlatoria blanchardi* (Targioni Tozzetti),which is considered as a main pest on date palm in various localities. In last decade, a scale insect was observed with high population density on date palm fronds and dates in El-Wahat Region causing yellowish of the pinnae and dryness of the fronds (Ghabbourand Mohammad, 2010). The scale insect was collected and identified as *Fiorinia phoenicis* Balachowsky (Hemiptera: Diaspididae) by Ghabbour and Mohammad (2010) as a new record on date palm in Egypt, the scale insect increased greatly and spread on date palm in many territories and become a key pest on date palm. *F. phoenicis* was recorded on date palm in Iraq (Hussain, 1974), Saudi Arabia (Matile, 1984).

Sultanate of Oman (Ghabbour *et al.*, 1996); (Aly and Elwan, 1995) and Iran (Takagi and Moghaddam, 2005), Egypt (Ghabbourand Mohammad, 2010). A severe infestation was found greatly on the growth of the date palm especially the offshoots, the quality of infested dates become less marketable (Elwan *et al*., 2011). *F. phoenicis* as a new pest on date palm in Egypt needs many studies on its ecological aspects in different territories. So, the present work was carried out to study some ecological aspects of this pest on date palm trees under field conditions of Sharkyia Governorateto design an integrated pest management program for its control.

MATERIAL AND METHODS

The seasonal abundance of *F. phoenicis* was conducted on date palm trees variety Barhy cultivated in a private orchard in Minia El-Qamh, Sharkyia Governorate during 2013 and 2014. Six date palm trees, almost similar in age, height, and vigor growth which heavily infested with *F. phoenicis* were chosen randomly. The chosen trees were reserved the normal agricultural practices without any insecticidal applications before and during sampling processes and without pruning. Fortnightly samples were taken for two successive years (January, 2013 to December, 2014). The samples (60 leaflets) were picked up at random from all directions with a rate of 10 leaflets/tree (each leaflet about 30 cm in length). Thereafter, the collected samples kept in closed paper bags and transferred to the laboratory for inspection with the aid of stereoscopic microscope. In each sample, the alive individuals were counted and sorted to different developmental stages (nymphs and Adults). The half monthly means of nymphs and adults/10 leaflets were graphically illustrated. Records of the main weather factors (means of temperature and mean percentage of relative humidity) were obtained, from Central Laboratory for Agriculture Climate (C.L.A.C.). Ministry of Agriculture, Giza, Egypt. Simple correlation and regression analysis as well as partial regression were done by using computer (SAS Institute, 1989) to study the relationship between the insect population and weather factors.

RESULTS AND DISSOCIATION

Seasonal fluctuation of the nymphal population

Data illustrated in Figs. (1&2) showed the seasonal fluctuation of the nymphal population in the both years 2013&2014. In the first year the obtained data showed three peaks for the nymphal population, the first peak occurred in mid of June (638 nymphs /10 leaflets) under field condition 33°C &60 % R.H., the second peak was occurred in mid of September (983 nymph /10 leaflets), at 35°C& 66 % R.H., whereas the third peak was occurred in mid of November (1012 nymphs /10 leaflets) at 24°C& 56% R.H. under field conditions.

In the second year the nymphal population had the same trend and recorded three peaks, the first was occurred in mid of June (337 nymphs /10 leaflets) under field conditions 34° C& 63 % R.H.and the second peak was recorded in mid of September (781 nymphs /10 leaflets) at 38°C& 65 % R.H.whereas the heights peak was in mid of November(834nymphs /10 leaflets) at 25°C& 58 % R.H.

The obtained results showed that, the nymphal population peaked three times per year and the highest peak occurred in summer and autumn seasons whereas the lowest peak was in winter season. It can be concluded that, the changes in weather factors affected on the nymphal activity in both years and the highest activity of *F. phoenicis* occurred in summer and autumn seasons, respectively.

Seasonal fluctuation of adult females

The population of adult females Figs. (1&2) were varied and lower compared with the nymphal population in the two years 2013&2014. The data showed that three small peaks for adult females per year. In the first year 2013 the peaks occurred in early of June (337 adult female / 10 leaflets) at 34 ° C & 63 % R.H., early of September (781 adult female / 10 leaflets) at 38 °C&65 %R.H. and mid of November (834 adult female / 10 leaflets) at 25 °C &58%R.H. for the three peaks, respectively.

In the second year 2014the adult females population peaked three times, the first peak occurred in early of June (215 adult female / 10 leaflets) at 34 ° C & 63 % R.H., the second peak occurred in early of September (605 adult female / 10 leaflets) at 38 ° C & 65 % R.H. whereas the third peak was in early of October (589 adult female / 10 leaflets) at 25 °C & 58 % R.H.

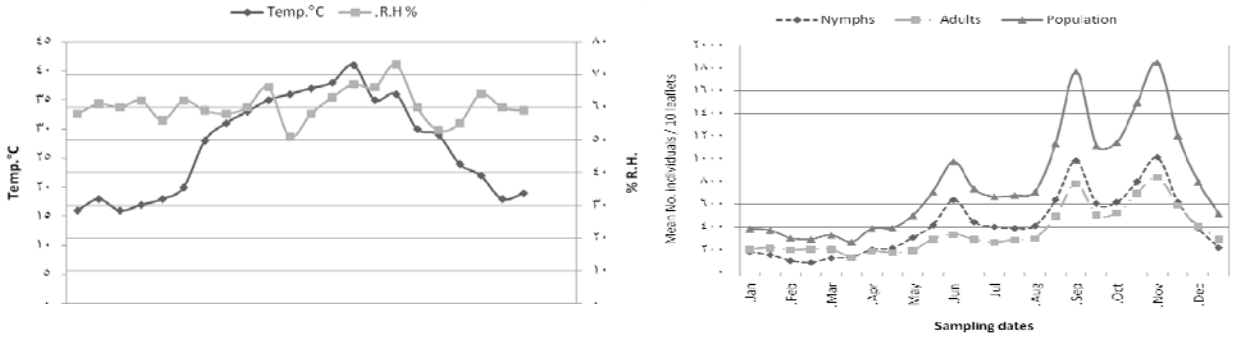

Fig. 1: Seasonal fluctuations of *F. phoenicis* on date palm trees with corresponding means of main climatic factors at Minia El-Qamh, Sharkyia, Governorate during 2013.

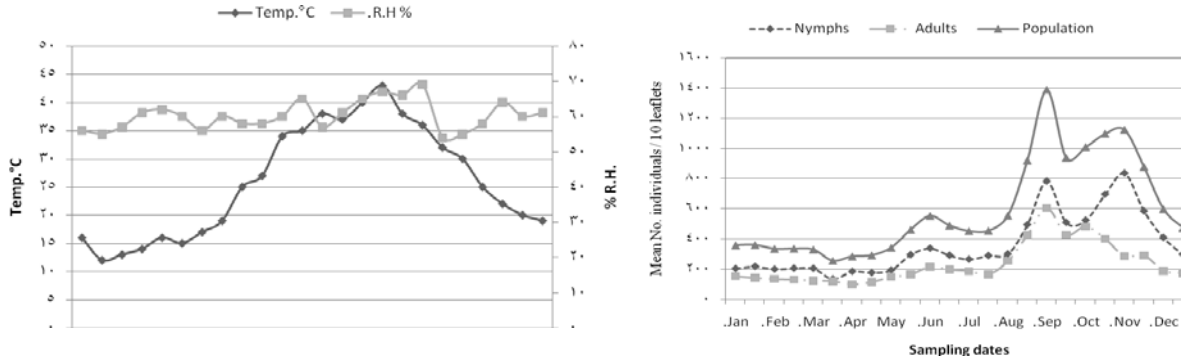

Fig. 2: Seasonal fluctuations of *F. phoenicis* on date palm trees with corresponding means of main climatic factors at Minia El-Qamh, Sharkyia, Governorate during 2014.

Number and duration of generations

Results obtained in Table (1) showed that *F. phoenicis* had three overlapping generations a year under field conditions. The generations were as following:

During the first year, the first generation started from end of February to end of July, peaked in mid of June, the duration of this generation lasted about 5 months with an average of (538.2mean number of alive individuals/10 leaflets) and was lowest population density and longest one. The second generation lasted from end of August to end of October, peaked in early of September; the duration lasted about 2 months with an average of (1172.0mean number of alive individuals/10 leaflets).The third generation started from early of October to end of December; peaked in early of November, the duration lasted about 3 months with an average of (1169.8mean number of alive individuals/10 leaflets).The second and third generations were the highest in first year.

Table 1: Number and duration of generations of *F. phoenicis* under field conditions on date palm trees at Minia El-Qamh, Sharkyia, Governorate during 2013 & 2014.

Years	Generations	Duration of generations				Generation density
		From	To	Peak	Duration (month)	
2013	1st G.	End Feb.	End Jul.	Mid Jun.	5	538.2
	2nd G.	End Aug.	End Oct.	Early Sep.	2	1172
	3rd G.	Early Oct.	End Dec.	Early Nov.	3	1169.8
2014	1st G.	End Mar.	End Jul.	End Jun.	4	352.6
	2nd G.	End Jul.	End Sep.	Early Sep.	2	699.8
	3rd G.	End Sep.	End Dec.	Early Nov.	3	814.2

On the other hand in the second year, the first generation started from end of March to the end of July, peaked in end of June, lasted 4 months with an average of (352.6mean number of alive individuals/10 leaflets). The second generation start deformed of July to end of September, peaked in early of September lasted about 2 months and generation density was (699.8mean number of alive individuals/10 leaflets). The third generation started from end of September and continued until the end of December, peaked in early of November. It lasted about 3 months with an average of(814.2mean number of alive individuals/10 leaflets).

The afore-mentioned results showed that, the first generation prolonged 4–5 months with lower population than second and third generations. The prolonged period of this generation refers to unfavourable climatic conditions in winter season and the long ovipositional period caused considerable overlapping of generations.

These results are agreement with those obtained by Elwan *et al.,* (2011) which stated that *F. phoenicis* has three annual overlapping generations on date palm at Giza Governorate.

Effect of the main climatic factors on the changes in annual generations The first generation Effect of daily mean temperature:

Results obtained in Table (2) showed that a positive and highly significant (r = 0.698& 0.618) for the daily mean temperature. The partial regression coefficient showed insignificant effect (t value = 2.31& 1.50) when the daily mean relative humidity become around its mean. The obtained results revealed that, daily mean temperature within the optimum range of population activity during the first generation for both years, respectively.

Effect of percentage of relative humidity:

Daily mean relative humidity showed that a negative and significant relation for percentage of relative humidity in both years, (r= - 0.654&- 0.631) in both of years, respectively. The partial regression coefficient showed a negative and insignificant effect for this factor on population density (t value = - 0.69& - 1.30) when the daily mean temperature become around its mean. The obtained results revealed that, mean relative humidity around the optimum range of population density in first generation in both years, respectively.

The combined effect of the main weather factors.

The combined effect of both daily mean temperature and percentage of relative humidity showed that significant effect (F= 5.9 & 7.6) on the population density in first generation in both years, respectively. The changes in half monthly counts of the

population referred to the effect of the tested weather factors ranged 71.2% &63.4% in both years, respectively.

Table 2: Statistical analysis for simple correlation and partial regression to investigate the effects of the main weather factors of total population of *F. phoenicis* on date palm trees at Minia El-Qamh, Sharkyia, Governorate during 2013& 2014.

Years	Generation	Source of Variance	Simple Correlation " r "	Partial regression			ANOVA	
				b.	± s.e	T value	"F" value	E.V %
2013	G1	Mean Temp. °C.	0.698**	21.9	3.2	2.31	5.9*	71.2
		Mean % R.H.	- 0.654*	- 19.7	2.7	- 0.69		
	G2	Mean Temp. °C.	0.694*	65.2	4.8	2.01	4.7	59.9
		Mean % R.H.	- 0.551	- 29.9	5.6	- 2.00		
	G3	Mean Temp. °C.	0.721**	31.9	3.6	1.65	8.2**	70.2
		Mean % R.H.	- 0.523	- 26.9	3.7	- 0.54		
2014	G1	Mean Temp. °C.	0.618**	18.5	4.6	1.50	7.6*	63.4
		Mean % R.H.	- 0.631*	- 23.9	2.1	- 1.30		
	G2	Mean Temp. °C.	0.718*	38.4	4.6	1.50	4.9	69.7
		Mean % R.H.	- 0.681	- 28.4	3.3	- 2.20		
	G3	Mean Temp. °C.	0.767	33.1	3.1	1.55	6.3**	58.9
		Mean % R.H.	- 0.492	- 18.4	3.9	- 0.63		

The second generation Effect of daily mean temperature:

Daily mean temperature showed a positive and significant relation on the population density (r = 0.694 & 0.718)in both years, respectively. The partial regression coefficient showed insignificant effect for this factor (t value = 2.01&1.50) in both year, respectively when the daily mean relative humidity become around its mean. The obtained results revealed that, daily mean temperature become around optimum range of population density in the first year and under the optimum range in the second year, respectively.

Effect of percentage of relative humidity:

Daily mean relative humidity showed a negative insignificant relation (r = - 0.551& - 0.681) on the population density in the second generation in both years. The partial regression coefficient showed negative insignificant effect for this factor in both years (t value = -2.00& - 2.20) when the daily mean temperature become around its mean. The obtained results revealed that, daily mean relative humidity within the optimum range of the population density in both years, respectively.

The combined effect of the main weather factors:

The combined effect of both daily mean temperature and relative humidity showed that insignificant effect (F = 4.7&4.9) on the population in both years, respectively. The changes in the half monthly counts of the population referred to the effect of the tested weather factors ranged 59.9. &69.7.0%in both years, respectively.

The third generation Effect of daily mean temperature:

Daily mean temperature showed positive relation, highly significant in the first year (r = 0.721 & 0.767) in both years, respectively. The partial regression coefficient showed significant effect for this factor (t value = 1.65&1.55) in both years, respectively when the daily mean relative humidity become around its mean. The obtained results revealed that, daily mean temperature under the optimum range of population density in the first year and within the optimum range in the second one.

Effect of percentage of relative humidity:

Daily mean of relative humidity showed negative relation, insignificant effect (r = -0.523 & - 0.492) on the population in the third generation in two years, respectively. However, the partial regression coefficient showed negative insignificant effect for this factor in both years (t value = - 0.54& - 0.63) when the daily mean temperature become around its mean. The obtained results revealed that, daily mean relative humidity around optimum range of the activity in both years, respectively.

The combined effect of the main weather factors:

The combined effect of both daily mean temperature and relative humidity in the third generation was highly significant (F = 8.2&6.3) in the first year and second one, respectively. The changes in the half monthly counts referred to the effect of the tested weather factors ranged (70.2 & 58.9%) in both years, respectively.

The aforementioned results showed that, *F. phoenicis* has three overlapping generations per year under environmental conditions of Sharkyia Governorate. In this respect, In Egypt, Elwan *et al*. (2011) mentioned that, *F. phoenicis* has three overlapping generations under optimal conditions of Giza Governorate.

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ARABIC SUMMERY

ديناميكية التعداد لحشرة النخيل القشرية البنية *Fiorinia phoenicis* على نخيل البلح صنف برحى فى محافظة الشرقية – مصر

عباس سيف النصر يوسف ،نادية عبد الله على،صابر فهيم محمود موسى
معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقى – الجيزة

سجلت حشرة النخيل القشرية البنية فى مصر خلال السنوات القليلة الماضية على نخيل البلح بمنطقة سيوة بمصر حيث ظهر ت بأعداد كبيرة على سعف وثمار البلح تسببت فى مشاكل اقتصادية مما أستدعى أجراء دراسات بيئية عاجلة للحد من أنتشارها ووضع برنامج لمكافحتها، أجريت الدراسة الحالية على صنف النخيل برحى وهو من الأصناف الجديدة فى مصر ذات العائد الأقتصادى العالى وذلك فى مركز منيا القمح محافظة الشرقية لمدة عامين متتالين (يناير 2013 – ديسمبر 2014) بهدف دراسة التغيرات فى تعداد الآفة على مدار العام وذلك للأطوار الكاملة وغير الكاملة وتحديد مدة الجيل وعدد الأجيال وتأثير العوامل المناخية السائدة بالمنطقة على نشاط الحشرة بغرض وضع أستراتيجية لبرنامج مكافحة متكامل يحد من أنتشارها.

أوضحت نتائج الدراسة وجود ثلاثة أجيال متداخلة على مدار العام ، حيث أمتد الجيل الأول نشاطهمن نهاية فبراير حتى نهاية يوليو وكانت ذروة النشاط فى منتصف يونيو و مدة الجيل حوالى 5 شهور بمتوسط 538.2 حشرة / 10خوصة وكان متوسط درجة الحرارة 25.5 درجة مئوية والرطوبة النسبية61 %، بينما أمتد الجيل الثانى من نهاية أغسطس حتى نهاية أكتوبر وكانت قمة النشاط فى أوائل سبتمبر ومدة الجيل حوالى شهرين ومتوسط تعداد الجيل 1172 حشرة / 10خوصة ، أما الجيل الثالث أمتد من أوائل أكتوبر حتى نهاية ديسمبر وقمة النشاط كانت فى أوائل نوفمبر ومدة الجيل حوالى ثلاثة شهور وذلك فى العام الأول ومتوسط تعداد الجيل 1169.8حشرة/10خوصة ، وكانت النتائج خلال السنة الثانية متقاربة مع نتائج السنة الأولى بأستثناء أختلافات ضئيلة ترجع لأختلاف بسيط فى درجات الحرارة والنسبة المئوية للرطوبة النسبية فالجيل الأول أمتد نشاطه من نهاية مارس إلى نهاية يوليو وذروة النشاط فى نهاية يونيو ومدة الجيل حوالى أربعة شهور بكثافة عددية 352.6 حشرة / خوصة وكان متوسط درجة الحرارة 27.5 درجة مئوية والرطوبة النسبية 59.5% ، بينما أمتد الجيل الثانى من نهاية يوليو حتى نهاية سبتمبر وقمة النشاط فى أوائل سبتمبر ومدة الجيل شهرين بكثافة عددية 699.8 حشرة / خوصة وكان متوسط درجة الحرارة 36.5 درجة مئوية والرطوبة النسبية 65.5% أما الجيل الثالث فقد أمتد من نهاية سبتمبر حتى نهاية ديسمبر وذروة النشاط فى أوائل نوفمبر ومدة الجيل ثلاثة شهور وكان متوسط درجة الحرارة 24.5 درجة مئوية والرطوبة النسبية 59.5% . ويعتبر الجيل الأول أطولها من حيث المدة وأضعفها من حيث التعداد أما الجيل الثانى والجيل الثالث متقاربين منحيث المدة والكثافة العددية حيث سجل الجيل الثانى شهرين بمتوسطات 1172 و 699.8 حشرة/10خوصة خلال السنتين على التوالى بينما الجيل الثالث سجل ثلاثة شهور فى السنتين بمتوسطات 1169.8 و 814.2 حشرة/10خوصة على التوالى ، وكان التأثير المشترك لمتوسطات درجات الحرارة اليومية والرطوبة النسبية السائدة بالمنطقة متبايناً على نشاط الحوريات والحشرات الكاملة فى الاجيال الثلاثة فى سنتى الدراسة حيث كانت فى الجيل الاول 71.2& 63.4 % ، الجيل الثانى 59.9 & 69.7 % أما الجيل الثالث فكانت 70.2 & 58.9 % خلال سنتى الدراسة على التوالى.