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Seasonal Occurrence of *Parlatoria ziziphi* (Lucas) and Its Parasitoid in Relation with some Climatic Factors and Chemical Components on Navel Orange Trees

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ABSTRACT

The black parlatoria scale insect, *Parlatoria ziziph*i (Lucas) is one of the most important armored scale insect infesting citrus trees. This investigation was conducted at Inshas El-Raml district, Sharkia Governorate throughout the two seasons 2016-2017 and 2017-2018 to study some ecological aspects of this scale insect on navel orange trees. This study showed that the seasonal activity of this insect was more abundant in the first season than in the second one, due to the relation with its associated parasitoid. The *P. ziziphi* had three generations and two peaks of the total alive stages during winter and autumn seasons throughout the two years of investigation. Also, the increase or decline of populations was correlated with some climate factors as temperature, relative humidity and light intensity and also influenced by some chemical components in navel orange trees. These results can be beneficial when developing an integrated program for control this pest without the use of pesticides that may pollute the environment.

Keywords: *Parlatoria ziziphi* , Seasonal fluctuation, parasitoid ,chemical components, navel orange trees.

INTRODUCTION

Navel orange is one of the most important cultivated citrus trees in Egypt due to their plantations reached about 485940 feddans producing a yield of approximately 4.272.868 tons, according to the Economic Agricultural Report, 2018. Citrus trees were attacked by many insect pests and phytopathogenic. These insects insert its mouth parts into plant tissue and sucks sap from parenchyma cells. This infestation may cause blocks the photosynthesis operation, yellow leaves, defoliation, die back of twigs, eventually large branches and fruits drop. During the feeding, the scale insect injects a toxic substance into its host plant with excreta in its saliva (Belguendoz *et al*., 2011and Hassan *et al.*, 2012).

The black parlatoria scale insect, *Parlatoria ziziphi* (Lucas),(Homoptera :Diaspididae) is considered as the most important pest which infesting many species of trees and 192 of host plants belong to 77 families. It was recorded in Egypt by many researchers (Kamel, 2010; Moustapha, 2012 and Tawfeek, 2012) and reported in some countries by Franco *et al.,* 2006; Haddad and Sadoudi, 2017 and Romos-Portilla and Caballero, 2017.

However, the important of this insect is mostly related to infestation that reduced the market values of fruits. Biological control of this insect had focused on its parasitoid, *Aphytis* sp.,(Hymenoptera: Aphelinidae) is widely regarded as the most important parasitoid of *P. ziziphi* in citrus orchards (Kamel *et al*., 2003 and Abd-Rabou *et al*., 2014). Moreover, the using of insecticides influenced the success of biological control in integrated pest management programs for this pest.

The different in climate and chemical factors played as an extrinsic integrative factor for determining the abundance and distribution of insect pest population.

So, the researchers had focused on its ecological parameters to specify the best timing for controlling.

Therefore, the scope of study included the seasonal abundance of *P. ziziphi* and its parasitoid on navel orange trees and the effect of some abiotic factors as temperature, relative humidity and light intensity and some chemical constituents of the trees on the population dynamics of the insect pest.

MATERIALS AND METHODS

An experimental area of about one fadden of navel orange trees, *Citrus sinensis* (L.) was chosen at Inshas El-Raml district, Sharkia Governorate to conduct this investigation with no insecticides applications for the two consecutive years, starting from November 2016 until October 2018.

Study design and sampling procedure

Five of navel orange trees which were similar in age, size, height and growth vegetation were chosen for sampling. Samples ,twenty ones from each tree, were taken twice monthly, representing north, south, east and west directions of the tree. Leaves samples were kept in plastic bags and transferred to the laboratory for inspection by using binocular microscope which recorded the total numbers of different stages of the insect pest and its parasitoid on both upper and lower surfaces of them. Data of monthly counts of nymph stage were indicated on millimeter paper and applied the formula proposed by Audemard and Milaire (1975) and emended by Jacob (1977) for estimating the number of generations and their annual durations.

Seasonal activity of parasitoid

The scale insects were separated into healthy and parasitized ones and presented in glass jars covered with muslin cloth and kept in the laboratory till the emergence of adult parasitoids. Emerged parasitoids were counted and estimated the total parasitism percentage.

Effect of some weather factors

For clarifying the effect of certain climatic factors as maximum temperature, minimum temperature, relative humidity and solar radiation on the population of studied insect and its associated parasitoid. Monthly means of these factors were provided by the Meteorological Central Laboratory, Agricultural Research Center, Ministry of Agriculture. While, light intensity (Lux) was measured at mid-day (12 *a.m.*) using Luxmeter during the period of the study.

Chemical analysis

Hundred grams of growth leaves dried of navel orange were taken monthly in both seasons for determining some chemical constituents. The constituents were assessed as follows: protein was determined according to procedure described by Gornall *et al.* (1949). Total carbohydrates were determined using the method described

by Miller (1959) and Gomma (2005). Fats were estimated according to Knight *et al.* (1972) and The chlorophyll content average (chlorophyll a and chlorophyll b) of leaves were extracted and estimated spectrophotometrically according to (Moran,1982; Nabil and Elshafiey, 2011 and Nabil 2013).

Statistical analysis

Simple correlation values (r) and total explained variance (E.V.%) were calculated using COSTAT Computer Program(2005).

RESULTS AND DISCUSSION

Population density of *Parlatoria ziziphi* (Lucas) and its associated parasitoid

Alive stages

Data obtained in Tables (1 and 2), illustrated that the seasonal fluctuation of different developmental alive stages, females, males and nymphs of the insect which represented by monthly numbers of alive individuals through the two successive seasons from November, 2016 to October, 2017 for the first season and from November, 2017 to October, 2018 for the second one. The total numbers of the insect stages were more abundant during the first season than in the second one. Two peaks of seasonal activity were recorded for this insect pest for each season. The highest peak recorded in January 2017 and 2018 and represented by 3513 and 2801 individuals /200 leaves (21.46% and 21.47%) followed by a small peak in September 2017 and 2018 and represented by 2347 and 1390 individuals /200 leaves (14.50% and 10.66%), respectively.

These periods found to be favorable conditions as maximum and minimum temperatures, relative humidity, solar radiation and light intensity to build-up insect population and their values were (25.4,26.9ºC) & (13.0,13.5ºC) & (76.2,77.3%) & (202.64, 232.58 MJ/m^2) and (56500, 66000 lux)for winter season during two years, respectively .While in the autumn season during the both years, the values were (37.3, 36.7ºC) & (16.0,16.8ºC) & (68.1,67.5%) & (432.3, 438.54MJ/m^2) and (83500, 82500 lux), successively. These results partially agree with the findings of Helmy (2000) and Tawfeek and Abu-Shall (2010).They stated that the activity peaks of *P. ziziphi* were throughout the spring ,autumn and winter seasons.

Total mortality Percentage

The obtained data arranged in Tables (1 and 2) recorded the total mortality for the insect pest during two successive seasons 2016/2017 and 2017/2018. It can be noticed that the total mortality percentage ranged between 10.3% in June 2017 and 39.1% in November 2016 in the first season. Meanwhile, during the second one, the total mortality percentage ranged between 5.9% in July 2018 and 60.8% in February 2018. The mean percentage of total mortality was highly in the second season than in the first one with values of 41.3% and 25.5%, respectively.

Percentage of parasitism

During the study, *Aphytis* sp. (Hymenoptera : Aphelinidae) was observed as associated parasitoid of *P. ziziphi.* Data in Tables(1 and 2) revealed that, the percentage of parasitism ranged between 1.8% in January and 13.7% in April 2017 during the first season. Meanwhile, this percentage ranged between 1.8% in July and 13.7% in April 2018 during the second season. The mean percentage of parasitism in the second year was higher (9.6 %) than in the first one (5.8 %).The highest rates of parasitism were recorded in April and February during the first and second seasons, consecutively.

We can concluded that the infestation rate was high in the first season with a low population of the parasitoid. On the other hand, the obverse results were obtained in the second season.

These results were closely agree with those Darwish, 2016 and Zaabta, 2016. They indicated that the *Aphytis* sp. was the important parasitoid attaking the black parlatoria and had 3 generations in autumn ,spring and summer seasons and its rate was 19.81%.per year.

Table 1. Seasonal abundance of *Parlatoria ziziphi* (Lucas) and its associated parasitoid on navel orange trees in Inshas El-Raml district, Sharkia Governorate during the first year (2016-2017)

Months	Total number of insects / 200 leaves							*Aphytis* sp.		Monthly average of climatic factors				
	Alive stages					Dead stages	Mortality %	No.	Parasitism %	Max. of Temp. (ºC)	Min. of Temp. (ºC)	RH (%)	Solar radiation (MJ/m^2)	Light intensity (Lux)
	Females	Males	Nymphs	Total	%									
Nov., 2016	746	102	35	883	5.4	558	39.1	45	3.1	23.9	15.0	70.5	188.27	68500
Dec.,	798	161	304	1263	7.7	374	22.9	36	2.2	24.2	14.0	73.4	187.96	65000
Jan., 2017	1814	723	976	3513	21.46	581	14.2	74	1.8	25.4	13.0	76.2	202.64	56500
Feb.,	966	665	250	1881	11.5	1114	37.2	223	7.5	27.4	13.0	81.9	313.38	57500
Mar.	758	431	59	1248	7.6	623	33.3	196	10.5	33.0	15.0	71.3	457.87	80000
Apr.	525	447	113	1085	6.6	457	29.7	211	13.7	36.4	17.0	67.0	550.96	88000
May	328	390	70	788	4.8	59	6.9	24	2.8	41.4	20.0	60.6	604.24	89500
Jun.	94	203	34	331	2.0	38	10.3	14	3.8	38.6	20.0	62.1	610.90	88500
Jul.	214	149	50	413	2.5	46	10.0	17	3.7	40.0	20.0	66.7	569.43	87500
Aug.	359	173	114	646	3.9	224	25.8	28	3.2	38.2	17.3	67.4	503.11	89500
Sep.	1329	194	851	2374	14.5	553	18.9	151	5.2	37.3	16.0	68.1	432.37	83500
Oct.	1124	228	590	1942	11.8	956	32.9	262	9.1	36.0	18.0	66.1	309.24	76500
Total	9055	3866	3446	16367		5591		1281						
Mean	754.58	322.17	287.17	1363.92		465.91	25.46	106.75	5.83					

Table 2. Seasonal abundance of *Parlatoria ziziphi* (Lucas) and its associated parasitoid on navel orange trees in Inshas El-Raml district, Sharkia Governorate during the second year (2017-2018)

Months	Total number of insects / 200 leaves							*Aphytis* sp.		Monthly average of climatic factors				
	Alive stages					Dead stages	Mortality %	No.	Parasitism %	Max. of Temp. (ºC)	Min. of Temp. (ºC)	RH (%)	Solar radiation (MJ/m²)	Light intensity (Lux)
	Females	Males	Nymphs	Total	%									
Nov., 2017	996	176	208	1380	10.6	1549	52.9	346	11.8	29.7	17.0	76.2	223.65	70000
Dec.	897	202	291	1390	10.7	1305	48.4	324	12.0	27.7	15.0	80.8	187.74	69500
Jan., 2018	1464	710	627	2801	21.4	1347	32.4	206	4.9	26.9	13.5	77.3	232.58	66000
Feb.	861	539	173	1573	12.1	2438	60.8	570	14.2	27.9	14.0	77.4	331.38	65000
Mar.	761	418	86	1265	9.7	1007	44.3	296	13.0	38.7	17.0	67.0	463.15	76500
Apr.	337	326	67	730	5.6	532	42.2	172	13.6	38.1	17.0	65.1	559.92	89500
May	195	248	50	493	3.8	49	9.1	17	3.1	40.0	20.0	59.7	601.00	88500
Jun.	113	174	42	329	2.5	31	8.6	16	4.4	40.0	20.0	61.4	652.44	87000
Jul.	101	78	29	208	1.6	13	5.9	4	1.8	39.6	17.0	65.1	611.26	87000
Aug.	162	130	45	337	2.6	119	26.1	33	7.2	38.0	18.9	68.5	527.94	87500
Sep.	794	137	459	1390	10.7	352	20.2	68	3.9	36.7	16.8	67.5	438.54	82500
Oct.	676	147	325	1148	8.8	440	27.7	86	5.4	36.5	18.0	67.6	343.07	73500
Total	7357	3285	2402	13044		9182		2138						
Mean	613.08	273.75	200.17	1087.0		765.16	41.31	178.16	9.62					

Effects of some weather factors on different stages of *P. ziziphi*

Females population

Data illustrated in Tables (3 and 4) indicated that in the two seasons, each of minimum temperature and solar radiation had a negative highly significant effects (r=-0.722**, -0.797**, -0.712** and -0.893**). Relative humidity had a positive significant and positive highly significant effects, where r=0.598* and 0.793**, respectively. Light intensity had a negative significant and negative highly significant effects (r= -0.704* and -0.884**), successively. While, in the second season only, maximum temperature had a negative highly significant effect (r= -0.839**).

Males population

As shown in Tables (3 and 4) in the second year only, the correlation coefficient between the population of males and minimum temperature was negative significant (r= -0.666*).

Nymphs population

Obtained data in Tables (3 and 4) revealed that in the second season only, the correlation coefficient between the population of nymphs and each of maximum and minimum temperatures and light intensity were negative significant, where r= -0.626* , -0.622* and -0.620*, respectively. While, the solar radiation had a negative highly significant effect (r= -0.698**).

Total numbers of alive stages and its parasitoids

Data in Tables (3and 4) showed that in the first year, each of minimum temperature, solar radiation and light intensity had a negative significant effects (r=-0.658* , -0.591 and -0.657*, respectively).While in the second year, relative humidity had a positive highly significant effects, where r= 0.723** and 0.758** , respectively. The maximum and minimum temperatures, solar radiation and light intensity had a negative highly significant effects, where r= -0.802**, -0.755**, -0.808**, -0.712**, -0.808**, -0.670**, -0.832** and -0.787**, consecutively.

Table 3. Statistical analysis based on correlation coefficient and explained variance indicating the effects of climatic factors on different stages of *Parlatoria ziziphi* (Lucas) and its associated parasitoid on navel orange trees in Inshas El-Raml district, Sharkia Governorate during the first year (2016-2017)

	Max. Temp. (ºC)	Min. Temp. (ºC)	RH (%)	Solar radiation (MJ/m²)	Light intensity (Lux)	Explained Variance (%)
Number of females	-0.556	-0.722**	0.598*	-0.712**	-0.704*	90.44
Number of males	-0.272	-0.493	0.558	-0.145	-0.500	85.74
Number of nymphs	-0.249	-0.429	0.323	-0.476	-0.450	78.02
Total number of alive stages	-0.452	-0.658*	0.566	-0.591*	-0.657*	89.18
Total number dead stages	-0.517	-0.676*	0.694*	-0.615*	-0.659*	66.01
Total number parasitoid	-0.201	-0.068	-0.326	0.332	-0.159	36.91

Table 4. Statistical analysis based on correlation coefficient and explained variance indicating the effects of climatic factors on different stages of *Parlatoria ziziphi* (Lucas) and its associated parasitoid on navel orange trees in Inshas El-Raml district, Sharkia Governorate during the second year (2017-2018)

	Max. Temp. (ºC)	Min. Temp. (ºC)	RH (%)	Solar radiation (MJ/m²)	Light intensity (Lux)	Explained Variance (%)
Number of females	-0.839**	-0.797**	0.793**	-0.893**	-0.884**	91.99
Number of males	-0.546	-0.666*	0.419	-0.374	-0.565	70.83
Number of nymphs	-0.626*	-0.622*	0.554	-0.698**	-0.620*	73.20
Total number of alive stages	-0.802**	-0.808**	0.723**	-0.808**	-0.832**	88.82
Total number dead stages	-0.862**	-0.793**	0.833**	-0.762**	-0.879**	85.37
Total number parasitoid	-0.755**	-0.712**	0.758**	-0.670**	-0.787**	71.21

r* with 1 star indicates that the correlation coefficient is significant and with 2 stars (r) indicates highly significant correlation at 0.01% level of probability**

Total number of dead stages

Data illustrated in Tables (3 and 4) showed that in the first year, the minimum temperature and solar radiation had a negative significant effects (r= -0.676* and -0.615*, successively). Meanwhile in the second year, the maximum and minimum temperatures, solar radiation and light intensity had a negative highly significant effects, where r = -0.862**, -0.793**, -0.762** and -0.879**, respectively. Relative humidity had a positive significant and positive highly significant effects,where r= 0.694* and 0.833** in the two years, successively.

Explained Variance (E.V.%)

Data in Tables (3 and 4) showed clearly that the aforementioned climatic factors in the first year affected number of females, males, nymphs, total numbers of alive stages, number of parasitoid and dead stages by 90.44, 91.99, 85.74, 70.83, 78.02, 73.20, 89.18, 88.82, 36.91, 71.21, 66.01 and 85.37% during the two studied years, respectively. Haddad and Sadoudi (2017), reported that the explained variance for females was high dominance (76.3%).

From the above mentioned results, it was found that the population of tested insect was affected by the studied weather factors, as it had a high impact in the second season compared to the first one. However, there are other factors such as rainfall and wind speed need to be studied further. These results are in agreement with those obtained by El-Dash *et al.* (2002),who found that the temperature had negative effect on adult, which relative humidity was appositive correlation on most different hosts. Chouih *et al.* (2011),who mentioned that the weathers had a big influence for the spread and infestation of the scale insect which preferred high humidity and low mild temperature and light. Moustafa (2012),showed that the correlation between the number of pest and its parasitoid and the maximum and minimum temperature and relative humidity were significant or highly significant. Nabil and Shahein(2014), mentioned that there were strong correlation between some climatic factors and scale insect population and their parasitoids on navel orange trees. Zaabta (2016), studied the natural mortality of these scale insects due to climatic factors for young stages and physiological for adult females.

Number and duration of generations

Results given graphically in Fig. (1) illustrated that the black parlatoria scale insect was passed three annual field generations throughout the two successive years 2016-2017 and 2017-2018. The duration of first generation was the longest time and took five months from 1st November till 4th March. The second one was elapsed from 1stApril to 4th July and lasted four months. The duration of third generation was three months and occurred during the period from 1st August to 4th October. These results agree with those of Habib *et al.* (2009), Hassan *et al.*(2012) and Zaabta (2016) they mentioned that the scale had three generations per year on some citrus varieties.

Preferable leaf surface

Data in Table (5) showed that the insect pest preferred the upper leaf surface and attractive the highest total number of the different developmental stages of *P. ziziphi* and its parasitoid during the two seasons 2016/2017 and 2017/2018 and represented by (9868, 3883, 957, 7579, 6652 and1537 individuals) compared to the lower one which represented by (6499, 1708, 324, 5465, 2530 and 601 individuals) in the both years, successively. This obtained result may be due to the response to light trend. These results are in agreement with those of Tawfeek and Abu-Shall, 2010;Chouih *et al.*, 2011 and Taibi *et al.*, 2016 .They reported that the average numbers of scales on the upper surface of leaf were more abundant than that on lower one. The occurrence percentages of *P. ziziphus* per leaf were 85.8% for the upper surface and 14.2% for the lower one.

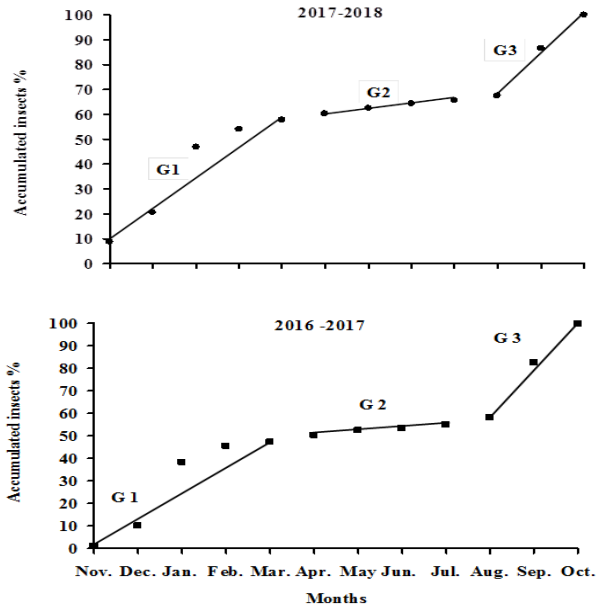

Fig. 1. Annual generations and their durations of *Parlatoria ziziphi* (Lucas) on navel orange trees in Inshas El-Raml district, Sharkia Governorate during the two successive years (2016-2017 and 2017-2018).

Table 5. Total numbers of *Parlatoria ziziphi* (Lucas) and its associated parasitoid on upper and lower leaf surfaces of navel orange trees during the two successive years (2016-2017 and 2017-2018)

Leaf surfaces	No. of alive stages	No. of dead stages	No. of parasitized	% of parasitism
First season 2016/2017				
Upper leaf surface	9868	3883	957	6.96
Lower leaf surface	6499	1708	324	3.95
Second season 2016/2017				
Upper leaf surface	7579	6652	1537	10.80
Lower leaf surface	5465	3530	601	7.52

Directions of the armed scale insect

Results illustrated in Fig. (2) showed that during the first and second years (2016-2017 and 2017-2018), this insect occurred in north eastern side of the trees making angles 79° 13′ 43″and 2° 29′ 22″, respectively. Also, the parasitoid occurred in north eastern side of the trees making angles 74° 3′ 16″and 23° 4′ 103″, consecutively.

Generally, illustrated data in Fig.(2) revealed that the armored scale insect, *P. ziziphi* and its associated parasitoid concentrated in the quarter of the trees north eastern direction.

These results were in accordance with those of Hammad *et al.* (2003 and 2004) who indicated that the insect infestation occurred almost in north-eastern and in north-western directions. Medjdoub (2014) who found that the north and the south were the most affected of the tree. Darwish (2016) who reported that the scale insect prefers to the existing leaves on the southern and eastern branches of mandarin tree.

Relationship between some chemical constituents of navel orange leaves on population density of alive stages of *P. ziziphi*

Results obtained in Table (6) showed that the correlation between the rate population of *P. ziziphi* and some chemical components in leaves of navel orange trees. The population of alive stages was positive highly significant correlated with carbohydrate contents in the first season. The relationship between the total soluble protein and the infestation was positive significant correlated in the second season. While, Fats insignificantly correlated with the population of alive stages.

These results are in agreement with those of Salem *et al.* (2006) in Egypt reported that carbohydrates and proteins are the main source of energy , amino acids and nitrogen for insects. Nabil (2010) suggested that the variation in the mean numbers of alive stages perhaps due to the variation in the leaf chemicals composition, mainly carbohydrates and fats.

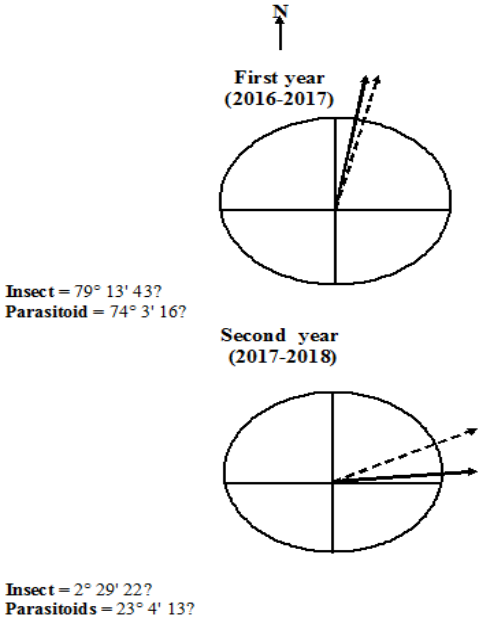

Fig .2. The calculated directions of *Parlatoria ziziphi* (Lucas) and its associated parasitoid on navel orange trees in Inshas El-Raml district, Sharkia Governorate during the two successive years (2016-2017 and 2017-2018).

Table 6. Relationship and correlation coefficient between mean number of alive stages of *Parlatoria ziziphi* (Lucas) and chemical composition (carbohydrates, fats, total soluble protein and chlorophyll content) of navel orange leaves, in Inshas El-Raml district, Sharkia Governorate during the two successive years (2016-2017 and 2017-2018)

Months	Total number of alive stages	Chemical analysis			
		Carbohydrates mg/kg	Fats mg/kg	Total soluble protein mg/kg	Chlorophyll mg/ inch^2
		First season			
Nov., 2016	883	251.65	86.36	23.70	25.38
Dec.	1263	290.78	58.70	24.25	18.38
Jan. , 2017	3513	357.30	108.11	25.79	3.72
Feb.	1881	342.56	101.72	25.18	11.87
Mar.	1248	303.82	63.13	24.95	19.67
Apr.	1085	321.21	99.18	24.41	21.52
May	788	293.39	87.37	25.11	27.87
Jun.	331	273.00	94.37	21.51	41.24
Jul.	413	295.13	72.04	22.66	38.17
Aug.	646	320.21	75.49	24.45	32.33
Sep.	2374	395.13	86.08	28.51	9.57
Oct.	1942	325.58	75.90	26.22	11.48
r		0.749**	0.400	0.218	-0.926***
		Second season			
Nov., 2017	1380	325.27	77.09	24.81	14.56
Dec.	1390	316.87	77.61	25.52	13.60
Jan., 2018	2801	351.65	78.30	29.63	4.08
Feb.	1573	321.21	68.68	28.89	12.26
Mar.	1265	341.65	39.94	28.00	18.20
Apr.	730	321.11	51.97	27.11	31.27
May	493	283.95	68.31	26.52	35.36
Jun.	329	273.08	68.63	24.81	42.86
Jul.	208	262.52	44.41	22.23	46.16
Aug.	337	302.08	72.18	23.34	40.27
Sep.	1390	390.78	88.37	27.33	12.33
Oct.	1148	320.11	75.41	23.22	21.39
r		0.159	0.405	0.699*	-0.931***

r* with 1 star indicates that the correlation coefficient is significant and with 2 stars (r**) indicates highly significant correlation at 0.01% level of probability (r***) indicates highly highly significant correlation at 0.001% level of probability

On other hand, negative and highly correlation coefficient were obtained between number of alive stages and the percentage of chlorophyll loss in the two seasons. In this study, the amount of chlorophyll differed between infested and uninfested navel orange leaves. The chlorophyll *a+b* concentration in un infested leaves was significantly higher than infested ones.

This result was closely agreed with those of Golawska *et al.* (2010) who determined the chlorophyll *a* and *b* levels in uninfested leaves and in leaves after 7 and 17 days of infestation. Feeding by pea aphids which have a piercing sucking mouth parts as scale insects which caused significant loss of chlorophyll *a* and *b* in the infested plants. Nabil (2019) studied the reduction on chlorophyll concentration between infested and un infested navel orange leaves with Parlatoria black scale, *P. ziziphi*, the un infested leaves had higher levels of chlorophyll in comparison with infested ones.

CONCLUSION

In this study it was found that the population of females and nymphs of tested scale insect was affected by biotic factors such as its associated parasitoid and abiotic factors such as temperature, humidity, light intensity.. Thus, a new theory can be reached to expand the use of associated parasitoid with this pest which may be beneficial when making progress in the integrated control of this pest.

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التواجد الموسمى لحشرة *parlatoria ziziphi* (Lucas) وطفيلها الحشرة فى علاقه مع بعض العوامل المناخية والمكونات الكيمائية على أشجار البرتقال أبو سرة

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تعتبر حشرة البارلاتوريا القشرية السوداء *Parlatoria ziziphi* (Lucas) من أهم أنواع الحشرات القشرية المسلحه التى تصيب أشجار الموالح ، تم إجراء هذا البحث فى منطقة إنشاص الرمل بمحافظة الشرقية خلال موسمين ٢٠١٦-٢٠١٧ و٢٠١٧-٢٠١٨ لدراسة بعض الظواهر الايكولوجية لهذة الحشرة. أظهرت النتائج أن النشاط الموسمى لتلك الحشرة كان أكثر وفرة فى الموسم الأول مقارنة بالموسم الثانى وذلك بسبب علاقتها مع طفيلها المصاحب لها، حيث أوضحت الدراسة أن للحشرة ثلاثه أجيال وقمتين نشاط موسمى للأفراد الحية أثناء فصلى الشتاء والخريف خلال عامى الدراسة. أرتبطت زيادة أونقصان تعداد الحشرة ببعض العوامل البيئية كالحرارة والرطوبة النسبية وشدة الأضاءة وإيضا تتأثر ببعض المكونات الكيميائية الموجودة فى أشجار الموالح ويمكن أن تكون هذة النتائج مفيدة عند تطوير برنامج متكامل لمكافحة هذه الأفة بدون أستخدام المبيدات التى قد تلوث البيئة.