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Population fluctuation of the floridana scale insect *Lindingaspis floridana* (Hemiptera: Diaspididae) on *Ficus benjamina* under greenhouse conditions in Cairo Governorate

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Abstract:

The results showed that the floridana scale insect *L. floridana* total population infesting *F. benjamina* trees in the greenhouse in El-Zohreya Botanical Garden, Cairo Governorate was higher in the 1st year (2015-2016) than 2nd year (2016- 2017) with mean of total population 84.53 and 64.10 individuals/10 leaves, respectively. *L. floridana* total population recorded 3 peaks of abundance in both years. The highest peak was recorded in mid-October 2015 with 196.84 individuals/10 leaves with corresponding maximum, minimum and relative humidity 30.90, 21.33°C and 76.70%, respectively. While, the lowest population was noticed in mid-July 2015 with 21.63 individuals/10 leaves with corresponding maximum, minimum and relative humidity 31.97, 21.80°C and 73.90%, respectively. The highest rate of increase was in July 2016 with 1.75. Also, the upper surface was more preferable to the insect than the lower one. *L. floridana* recorded 3 overlapping generations in both studied years where the longest one was 180 days and recorded in summer generation 2016 while the shortest one was 75 days in winter generation. The population of the associated parasitoid was relatively low. It recorded 3 peaks each year, the mean of the immature stages population was higher in the 2nd year than the 1st year with 10.19 and 8.43 individuals/10 leaves, respectively. The highest rate of parasitism was recorded in 1st April 2016 with 22.62%. But, the lowest rate of parasitism was recorded in September 2015 with 2.17%. The effects of corresponding abiotic and biotic factors were studied. Results revealed that, maximum and minimum temperatures independently had an insignificant effect on the total population of *L. floridana* on 1st and 2nd generations, but they gave a highly significant effect on the 3rd generation. While the relative humidity alone had an insignificant effect in both years and during the 3 generations. Whereas, the effect of the presence of associated parasitoid alone was significant in the 2nd generation in both years and in the 3rd generation it was insignificant relation. In case of, the effect of combined abiotic and biotic factors, it varied between significant and highly significant effect in both years which indicate that it effects of combined factors is more efficient on the population of *L. floridana* than each independent factor.

Introduction

The floridana scale insect *Lindingaspis floridana* Ferris (Hemiptera: Diaspididae) is a polyphagus armored scale insect belonging to Order Hemiptera, Superfamily Coccoidea, Family Diaspididae with worldwide distribution. It was first found in Florida 1921 (Miller *et al.*, 2005). It is believed to be originated in Aisa, but has invaded many tropical and subtropical regions of the world. Its listed as a harmful insect by Japan, Korea and Costa Rica. It infests many horticultural plants like mango (Bakr *et al*., 2009 and Attia and Radwan, 2013) and olive, fig and ornamental plants (ScaleNet , 2021). The scale insects feed on plant sap, and infestations causes leaves turn yellow color as their condition deteriorates. It sucks a great amount of sap are leading to dryness of the leaves then defoliation. Heavy infestations can result in stunting and death of leaves and dieback (Ezzat and Nada ,1986 and Hassan *et al.*, 2012).

L. floridana was found severely infesting Hawaiian ficus *Ficus benjamina* trees (Family : Moraceae) in El-Zohreya Botanical Garden, Cairo Governorate. It is an ornamental plant used as outdoor and indoor plants commonly known as weeping fig, benjamin fig or ficus tree, native to Asia and Australia. It can reach 30 meters tall in natural conditions. The infestation causes leaf malformation and the presence of insects on the leaves of an ornamental plant decreases the marketing measures of the plant and that is a big loss to the producers and exporters. Also, a parasitoid was found associated with *L. floridana*. Abd-Rabou (2001) stated that there are two parasitoids associated with *L. floridana* in Egypt, which were *Aphytis lingnanensis* Compere and *Encarsia citrina* (Craw) (Hymenoptera: Aphelinidae). The aim of this research is to study the population fluctuation of *L. floridana* infesting *F. benjamina* trees and its associated parasitoid and the effect of corresponding abiotic and biotic factors to detect the most suitable time for insect control.

Materials and methods

1. Sampling procedures:

The seasonal abundance of *L. floridana* on *F. benjamina* was studied throughout two successive years (2015-2016) and (2016- 2017) in a glass greenhouse in El-Zohreya Botanical Garden, Cairo Governorate. The selected trees did not receive any chemicals or pesticide treatment before or during the sampling procedures. Samples were taken biweekly of 5 leaves replicated 4 times and collected randomly from the trees. The samples were kept in plastic bags and transferred to the laboratory for examination. Inspection of leaves was conducted by the aid of stereomicroscope binocular to detect the different alive stages of *L. floridana* (Nymphs, adult females and gravid females). Also, the population of *L. floridana* was detected on both surfaces of leaves upper and lower surfaces. In addition, immature stages (Larvae and pupae) of a parasitoid were found associated with *L. floridana* and were counted in each sample. The rates of increase in the population density were calculated by dividing the total number of alive populations in any count over the total numbers of the previous one Bodenheimer (1951). Half monthly mean numbers of both *L. floridana* and its associated parasitoid different stages were smoothed by using three figures running mean.

2. Rates of parasitism:

The rate of parasitism was calculated according to the formula of Orphanides (1982).

$$\text{Rate of parasitism} = \frac{\text{Number of parasitized scale insects}}{\text{Total No. of parasitized and non-parasitized scale insects}} \times 100$$

3. Number of generations and annual durations:

Number and durations of annual generations were detected on ficus trees in Cairo Governorate for *L. floridana* throughout two successive years (2015-2016) and (2016-2017). The annual generations were estimated from data of the accumulated half monthly counts of mean alive immature stage, according to Jacob Formula (Jacob , 1977).

4. Effect of abiotic (Weather factors) and biotic factor (Accompanying parasitoid):

The main studied weather factors were mean maximum, minimum temperatures and mean percentages of relative humidity 2 weeks earlier were measured inside the greenhouse, with the aid of a hygrothermometer throughout the two successive years. In addition, the effect of the presence of the parasitoid as biotic factor in the total population of *L. floridana* was studied.

5. Statistical analysis:

Statistical analysis procedures were implemented in two steps, the first one to investigate the effect of each factor individually by applying simple correlation formula and regression coefficient, (r) was used as a measure of significance. The second step by applying C-multiplier Formula (Fisher, 1950) to investigate the effects of abiotic and biotic factors on the total population of *L. floridana*. The factors were studied individually and as a group. The changes of the population density expressed as percentages of explained variance (E.V.%) and the variance ratios (F values) were used as measure of significance in combination with each other. All calculations were carried out using Microsoft office Excel program ver. 2016.

Results and discussion

1. Population fluctuation of *Lindingaspis floridana* infesting *Ficus benjamina* trees in Cairo Governorate:

A study was conducted to inspect the population fluctuation of *L. floridana* different stages for 2 successive years (2015-2016) and (2016-2017) in a glass greenhouse in El-Zohreya Botanical Garden, Cairo Governorate. The results illustrated in Figures (1 and 2) showed the following:

1.1. Nymphal stage:

In the 1st year (2015-2016) nymphal stage recorded 2 peaks of abundance; the 1st peak was 19.82 nymphs/10 leaves in 1st May 2015, while the 2nd one was higher with 68.82 nymphs/10 leaves in mid-October. In addition, it was clear that, nymphs were found in their lowest population in March and from June to August months. On the other hand, in the second year (2016-2017) *L. floridana* recorded 4 peaks of abundance in 1st March, 1st May, 1st July and mid-November with 54.10, 52.49, 22.29 and 34.85 nymphs/10 leaves, respectively. Also, the most depression population was found on mid-August with 7.49 nymphs/10 leaves.

1.2. Adult females:

Data graphically illustrated in Figures (1 and 2) showed that adult female population was higher in the 1st year than 2nd year with averages 33.80 and 17.00 adult females/10 leaves, respectively. It recorded 4 peaks in 1st year, the highest one was recorded in mid-October 2015 with 88.35 adult

females/ 10 leaves. The other peaks recorded 16.47, 25.68 and 16.36 adult females/10 leaves in 1st March, 1st May and mid-February 2016, respectively. While, the lowest peak was recorded on mid-July with 8.78 adult females/10 leaves. Furthermore, in the second year, the insect recorded 3 peaks in 1st May as in the 1st year with 34.17 adult females/10 leaves**,** the other 2 peaks were lower in population with 16.48 and 29.92 adult females/10 leaves in 1st July and mid-November, respectively. The adult female population declined gradually in August, September 2016 and February 2017.

1.3. Gravid (Ovipositing) females:

Gravid females recorded 3 peaks in the 1st year (2015-2016), it started with a peak in the beginning of the year with 32.02 gravid females/10 leaves in 1st March 2015, then it recorded another two peaks in mid-November and mid-February 2016 with 46.48 and 44.28 gravid females/10 leaves, respectively. Furthermore, gravid females populations declined in the period between mid-May till the beginning of September. However, in the second year it recorded 2 peaks in 1st August and mid-October with 23.95 and 20.13 gravid females/10 leaves. The lowest population of gravid females was recorded on 1st of February 2017 with 6.57 gravid females/10 leaves.

1.4. Total population:

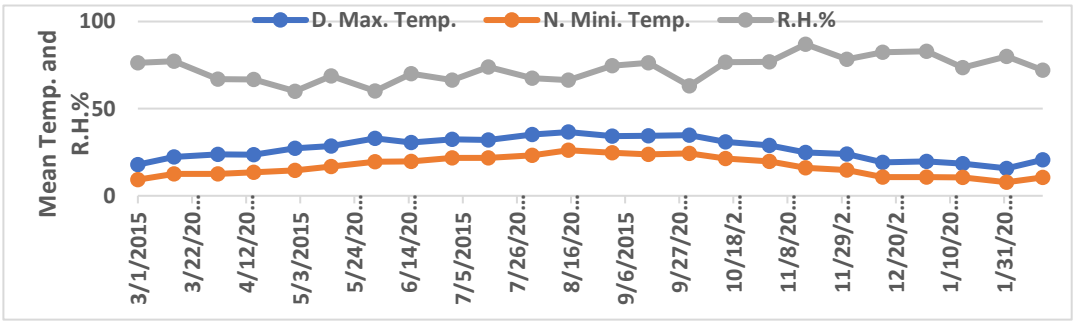
It was obvious that the total population was higher in the 1st year than 2nd year with mean of total population 84.53 and 64.10 individuals/10 leaves, respectively. In addition, the total population of *L. floridana* recorded 3 peaks of abundance in both years. In the 1st year, the highest peak was recorded in mid-October 2015 with 196.84 individuals/10 leaves. While the other 2 peaks were 65.66 and 107.85 individuals/10 leaves in 1st May and mid- February 2016, respectively. On the other hand, the lowest population of *L. floridana* was in mid-July 2015 with 21.63 individuals/10 leaves. Also, in the second year the total population of *L. floridana* recorded 3 peaks, the highest one was the 1st peak with 112.56 individuals/10 leaves in 1st May. The other 2 peaks were 56.32 and 82.39 individuals/10 leaves in 1st July and mid-November, respectively. In addition, the lowest population was noticed in mid-June and 1st February 2017 with 32.23 and 28.35 individuals/10 leaves, respectively.

In the 1st year the highest rates of increase, which indicate the most preferable time for the insect were recorded in mid-August and the beginning of September with 1.67 and 1.59 with an average maximum and minimum temperature and average relative humidity were 35.43, 25.42°C and 71%. While the lowest rates of increase were in mid-May, mid-July and 1st December with 0.62, 0.61 and 0.68 with an average maximum and minimum temperature and average relative humidity.28.12, 17.76°C and 74%. During the second year, the highest rates of increase were in 1st July and mid-October with 1.75 and 1.40 with an average maximum and minimum temperature and average relative humidity 31.62, 21.75 °C and 78%. On the other hand, the lowest rate of increase was in mid-June with 0.38 with maximum and minimum temperature and relative humidity 21.24,19.78°C and 62%.

In addition, in a study to determine the most infested surface of the leaves with *L. floridana* different stages. The results illustrated in Figure (3) showed that upper surface was the most infested surface with the insect different stages in both years with mean no. of total population 48.19 and 39.13 individuals/10 leaves while the lower surface were 36.41 and 25.00

individuals/10 leaves, respectively. From the previously mentioned results it can be concluded that, the highest numbers of *L. floridana* immature and adult stages was detected in October 2015 with 68.82 and 88.35 individuals/10 leaves. Therefore, the highest number of total populations was detected in October with 196.84 individuals/10 leaves. While the highest number of gravid females was observed in November with 46.48 gravid females/ 10 leaves. On the other hand, the lowest population of *L. floridana* was in mid-July 2015 with 21.63 individuals/10 leaves. The highest rate of increase was in July 2016 with 1.75. Also, the upper surface was preferable to the insect than the lower surface.

The obtained results are partially in agreement with Swailem *et al.* (1980) who found stated that heavy infestations of *Lindingaspis rossi* (Mask.) (Hemiptera: Diaspididae) on *F. benjamina* in Giza and Zagazig regions. Also, they found that the most abundant numbers of immature stages recorded in November, January and May in Giza and January, April and June in Zagazig. While the peaks of adult stage were recorded in September, November and January in Giza and January, July and September in Zagazig. In addition, total populations reached a large peak in autumn and early winter and a small one in spring and early summer; Danzig and Pellizzari (1998) stated that *Lindingaspis ferrisi* McKenzie (Hemiptera: Diaspididae) is known from China, Taiwan, Egypt, India and Pakistan on the upper surfaces of leaves. Tawfik and Mohammad (2001) stated that, *Hemiberlisia lataniae* (Signoret) (Hemiptera: Diaspididae) had four population peaks during the year on *Morus alba* in Giza Governorate. El-Sahn and Sadek (2014) found that *Chrysomphalus aonidum* (L.) (Hemiptera: Diaspididae) infesting *Dracena* shrubs was carried out under greenhouse conditions recorded 4 peaks during 1st year of investigation the highest one was in 1st of November 2010 (50.7 insects/ leaf) with maximum and minimum temperature (27.60°C, 17.35°C) and average relative humidity (79.83%). While in the second year it recorded 3 peaks of population; the highest peak was in mid of June (112.5 insects / leaf) with maximum and minimum temperature (32.20°C, 21.35 °C) and average RH. (71.70%).



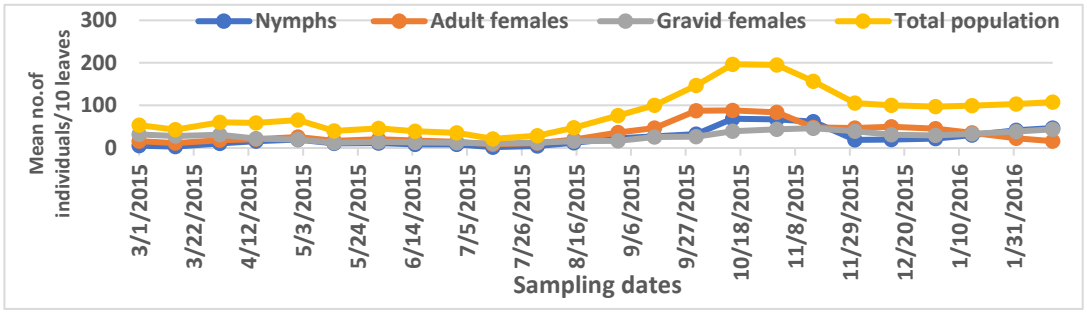
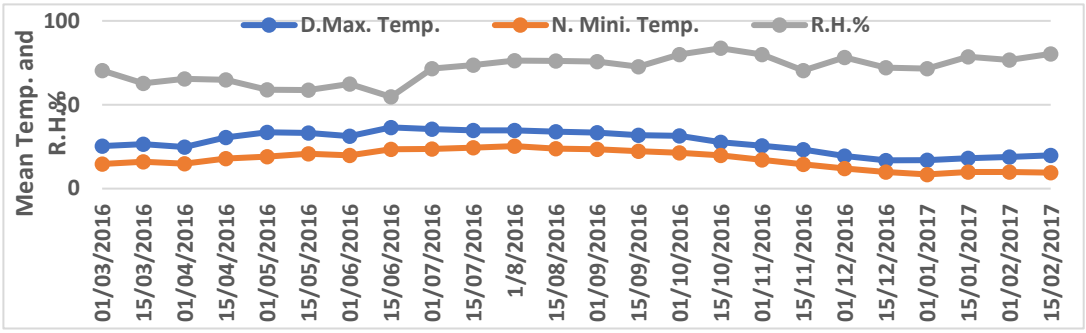


Figure (1): Population fluctuation of *Lindingaspis floridana* different stages infesting *Ficus benjamina* trees in Cairo Governorate throughout 2015-2016 with the corresponding main weather factors.



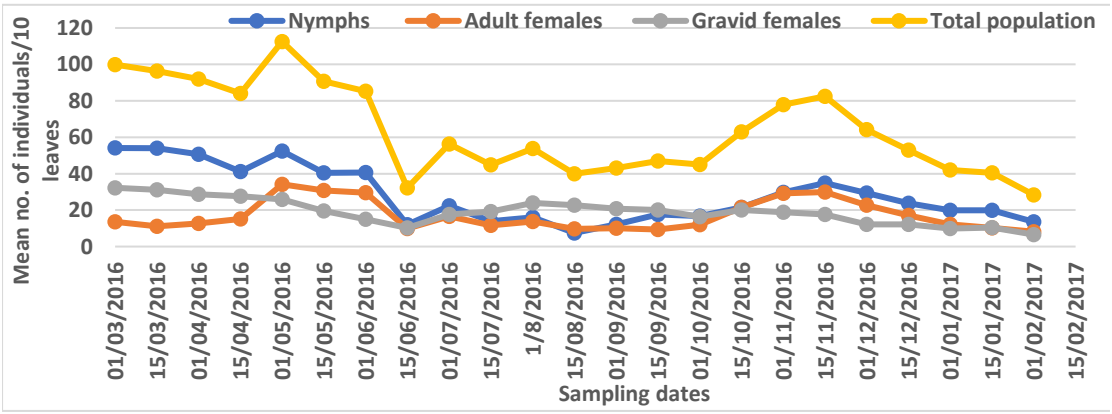


Figure (2): Population fluctuation of *Lindingaspis floridana* different stages infesting *Ficus benjamina* trees in Cairo Governorate throughout 2016-2017 with the corresponding main weather factors.

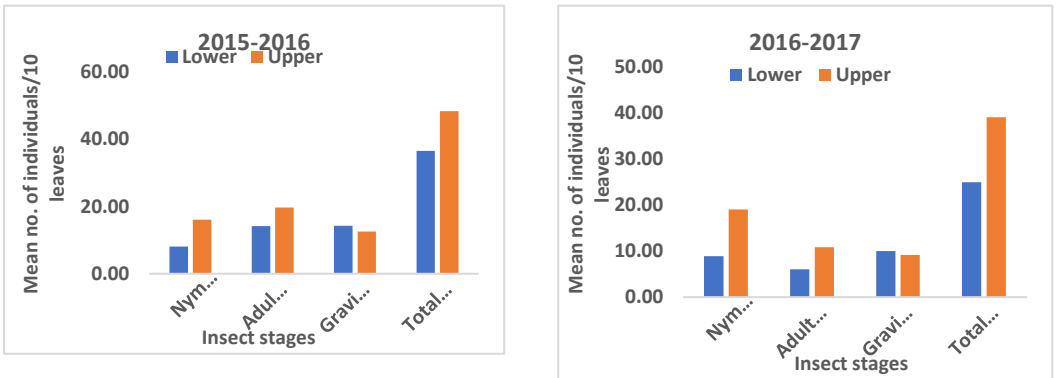


Figure (3): The distribution of total population of *Lindingaspis floridana* on the upper and lower surfaces of *Ficus benjamina* trees leaves during two successive years.

2. Durations and number of generations of *Lindingaspis floridana*:

The results illustrated in Figure (4) showed that, *L. floridana* recorded 3 overlapping generations in both studied years 2015-2016 and 2016-2017.

2.1. In the first year:

2.1.1. 1st generation (Spring generation) started from mid-March 2015 till 1st August with 135 days, with corresponding average temperature and relative humidity 23.24°C and 68% .

2.1.2. 2nd generation (Summer generation) was the shortest one which recorded 90 days started from mid-July till mid-October 2015. (Average temperature and relative humidity 28.82°C and 71%).

2.1.3. 3rd generation (Autumn and winter generation) recorded 135 days from 1st October 2015 till mid-February 2016 (Average temperature and relative humidity 19.17°C and 77%).

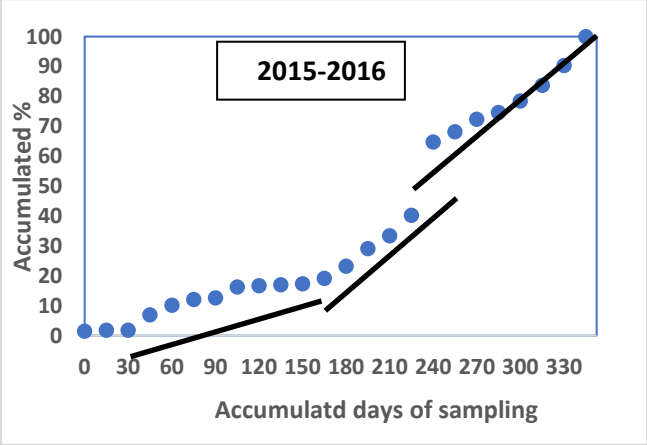
2.2. In the 2nd year:

2.2.1. 1st generation (Spring generation) started from 1st of March 2016 till 1st of June with 90 days (Average temperature and relative humidity 23.44°C and 64 %).

2.2.2. 2nd generation (Summer generation) started from mid-May 2016 till mid-November with 180 days (Average temperature and relative humidity 26.65°C and 72%).

2.2.3. 3rd generation (Autumn and winter generation) was the shortest one started from 1st of November 2016 till mid-January with 75 days. (Average temperature and relative humidity15.65°C and 76 %). From the previously mentioned results it can be concluded that, *L. floridana* recorded 3 overlapping generations in both studied years where the longest one was 180 days and recorded in summer generation 2016 while the shortest one was 75 days in winter generation.

From the previously mentioned results it can be concluded that, *L. floridana* recorded 3 overlapping generations in both studied years where the longest one was 180 days and recorded in summer generation 2016 while the shortest one was 75 days in winter generation.



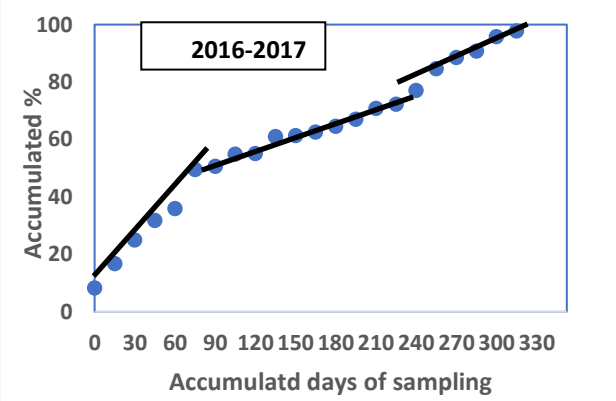


Figure (4): Number and durations of generations of *Lindingaspis floridana* during two successive years 2015-2016 and 2016-2017.

The obtained results were in agreement with (Hassan, 1993) who stated that *H. lataniae* which is a principal scale pest of *Ficus* sp. trees and other ornamental recorded two to four generations per year in Egypt, where the first generation crawlers appearing from mid-June to mid-July and second generation crawlers appearing in September. Gill (1997) in New Zealand who stated that *L. rossi* recorded one generation per year on Monterey pine, but there are up to three per year in Egypt. El-Sahn and Sadek (2014) found that *C. aonidum* infesting *Dracena* shrubs in green house had three generations in both years.

3. Population fluctuation of the associated parasitoid with *Lindingaspis floridana*:

From the present study it was found a parasitoid associated with *L.* . *floridana* infesting *F. benjamina* trees inside the greenhouse in El-Zohreya Botanical Garden, Cairo Governorate. The population of the parasitoid was relatively low, as shown in Figure (5). It recorded 3 peaks each year, the mean of the immature stages population was higher in the 2nd year than the 1st year with 10.19 and 8.43 individuals/10 leaves. In the 1st year, the highest population of the immature stages population was in mid-December 2015 with 16.12 individuals/10 leaves. The other two peaks were recorded in 1st March 2015 and 1st June with 5.38 and 5.26 individuals/10 leaves, respectively. In the 2nd year the highest population was recorded in mid-March with 27.54 individuals/ 10 leaves. While the lower peaks were 5.01 and 6.12 individuals/10 leaves in 1st August and 1st December 2016

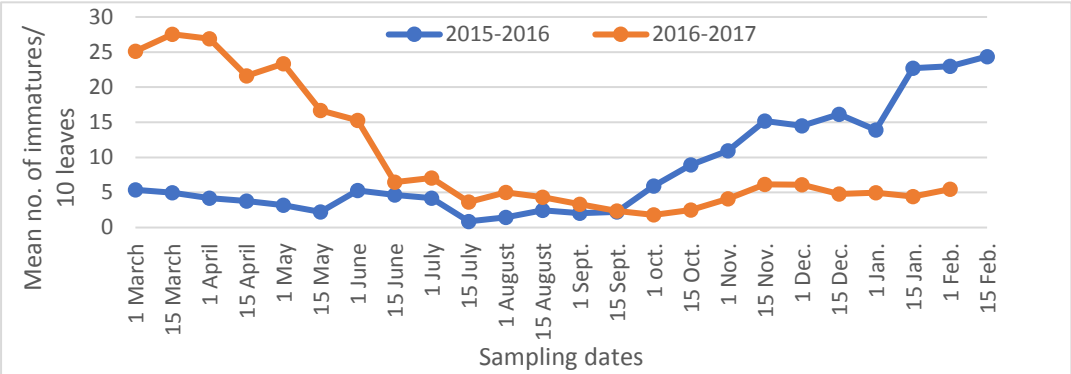


Figure (5): Population fluctuation of the associated parasitoid of *Lindingaspis floridana* infesting *Ficus benjamina* trees two successive years 2015-2016 and 2016-2017 in Cairo Governorate.

4. Rate of parasitism of the associated parasitoid:

The results illustrated in Figure (6) showed that the highest rate of parasitism in the 1st year was recorded in mid-January with 18.57%. Whereas, the lowest rate of parasitism was recorded in September 2015 with 2.17% While in the 2nd year the highest rate of parasitism was recorded in 1st April 2016 and 1st February 2017 with 22.62 and 16.12%, respectively. For the lowest rate was in October with 3.83%.

From the previously mentioned results, it can be noticed that the population of the associated parasitoid was relatively low. It recorded 3 peaks each year, the mean of the immature stages population was higher in the 2nd year than the 1st year with 10.19 and 8.43 individuals/10 leaves, respectively. The highest rate of parasitism was recorded in 1st April 2016 with 22.62%. But, the lowest rate

of parasitism was recorded in September 2015 with 2.17%. These results agree with Swailem *et al.* (1980) who mentioned that, the average rates of parasitism of *L. rossi* were 8.9 and 13.3% for *F. benjamina* in Giza and Zagazig and 13.2% on *Jasminum azoricum* in Giza.

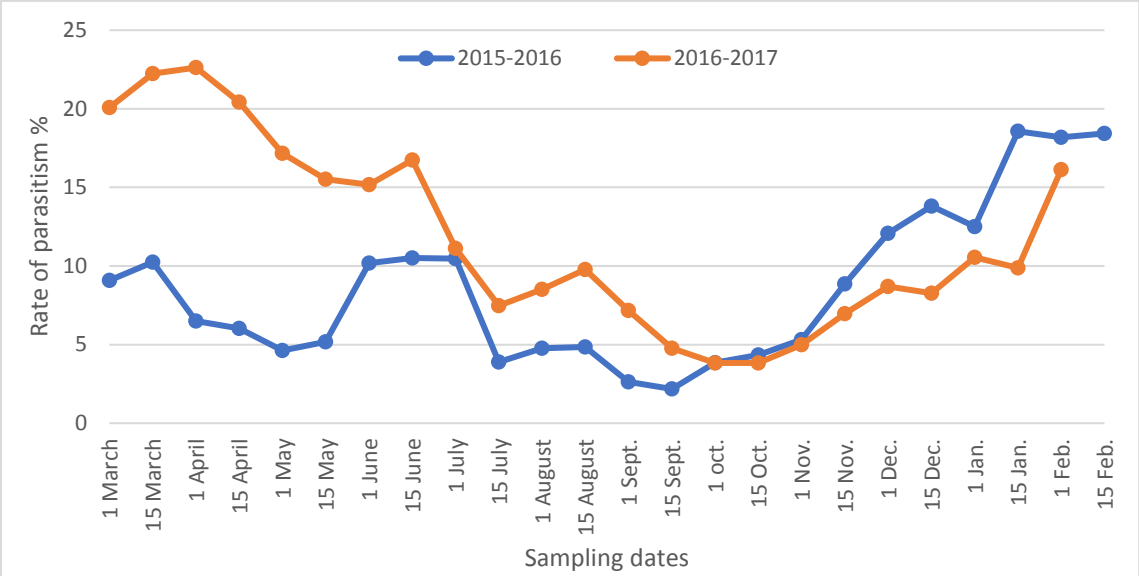


Figure (6): Rate of parasitism of the parasitoid associated with *Lindingaspis floridana* infesting *Ficus benjamina* trees in two successive years 2015-2016 and 2016-2017.

5. Effect of abiotic (Weather) and biotic (Parasitoid) factors on the total population of *Lindingaspis floridana*:

It was important to study the different factors affecting the fluctuation of the total population of floridana scale insect *L. floridana* in Cairo Governorate during the two successive years (2015-2016) and (2016-2017). Each year under investigation was divided into three generations to detect the effect of abiotic factors (Weather factors) and biotic (Associated parasitoid). Results in Tables (1 and 2) showed the following:

5.1. Effect of abiotic (Weather) factors on population of *Lindingaspis floridana*:

The effect of three weather factors (Maximum, minimum temperatures and relative humidity) was studied in the total population of *L. floridana* in Cairo Governorate during the two successive years (2015-2016) and (2016-2017) and it was taken into consideration the effect of weather factors two weeks earlier from the starting date of sampling.

5.1.1. The effect of mean maximum temperature on the total population of *Lindingaspis floridana*:

In the 1st year, it was clear that the effect of maximum temperature on the population of *L. floridana* was negatively insignificant in both 1st and 2nd generations with r=-0.673 and -0.437, respectively. While, the effect on the 3rd generation was positively highly significant with r=0.789. In the 2nd year, the effect of maximum temperature was insignificant in both 1st and 2nd generations with r=0.083 and -0.607, respectively. However, the relation was positively highly significant in the 3rd generation with r= 0.885.

5.1.2. The effect of mean minimum temperature on the total population of *Lindingaspis floridana*:

In the 1st year the relation between the mean minimum temperature and the total population of *L. floridana* was the same as in Maximum temperature where the

relation was negatively insignificant in the 1st and 2nd generations with r= -0.805 and -0.273, respectively. As in, the 3rd generation the relation was positively highly significant with r= 0.813. In addition, the effect of minimum temperature was negatively insignificant in both 1st and 2nd generations with r= -0.143 and -0.727 But, in the 3rd generation the relation was positively highly significant with r=0.916.

5.1.3. The effect of relative humidity on the total population of *Lindingaspis floridana*:

The mean relative humidity showed an insignificant relation with the mean of the total population of *L. floridana* in both years and in the 3 generations as well. Where it recorded negatively insignificant relation in 1st and 3rd generations with r= -0.523 and -0.105, respectively. But it gave a positively insignificant relation in 2nd generation with r= o.176. Almost the same was recorded in the 2nd year with negatively insignificant effect in both 1st and 2nd generations and positively insignificant in the 3rd generation with r= -0.153, -0.175 and 0.031, respectively.

5.2. Effect of biotic (Associated parasitoid) factor on population of *Lindingaspis floridana*:

In the 1st year, the effect of the presence of the associated parasitoid with *L. floridana* varied from a generation to another where the relation was positively significant in the 1st generation with r= 0.500. While in the 2nd generation the effect was negatively insignificant with r= 0.956. In the 3rd generation it gave a negatively insignificant relation with r= -0.668. In the 2nd year, the effect of the associated parasitoid was positively insignificant in the 1st and 3rd generations with r = 0.444 and 0.186, respectively. On the other hand, the 2nd generation, recorded a significant relation with r = 0.673.

5.3. The effect of the combined abiotic and biotic factors on the total population of *Lindingaspis floridana*:

Results in Tables (1 and 2) showed that in the 1st year (2015-2016), the combined effect of the three weather factors and the parasitoid on the population of *L. floridana* was highly significant in the three generations where the explained variance (E.V.%) recorded 97.70, 93.42 and 84.29%, with F values = 137.05, 7.10 and 6.71, respectively. Furthermore, in the 2nd year the combined effect recorded almost the same as in the 1st year where explained variances in the 1st generation was significant with 64.16% and F value = 0.89.

While, the combined effects in the 2nd and 3rd generations were highly significant with E.V. = 95.54 and 99.9% and F values =42.80 and 1710.20. From the previously mentioned results we can conclude that, maximum and minimum temperatures independently had an insignificant effect on the total population of *L. floridana* in both 1st and 2nd generations, but they gave a highly significant effect on the 3rd generation. While the relative humidity alone had an insignificant effect in both years and during the 3 generations. Whereas, the effect of the presence of associated parasitoid alone was significant in the 2nd generation in both years and in the 3rd generation it was insignificant relation. In case of, the effect of combined abiotic and biotic factors, it varied between significant and highly significant effect in both years which indicate that the effect of combined factors is more efficient on the population of *L. floridana* than each independent factor. These results agree with Williams and Watson (1988) who found that .*L. rossi* has been reported from many tropical countries and some temperate areas. Also, Moursi (1999) stated that the temperature had a significant effect on the development of

the *C.aonidum*. El-Sahn and Sadek (2014) found that the maximum, minimum temperature and relative humidity had negative significant exponential relationship regression on different alive stages of *C. aonidum* inside the greenhouse in Cairo Governorate.

Table (1): Statistical analysis for simple correlation and multicapsid regression to investigate the effect of abiotic and biotic factors on *Lindingaspis floridana* total population during 3 generations in the 1st year (2015-2016).

Factors	Simple correlation	Regression values				"F" value	Explained variance %
	"r"	"b"	s.e.	"t"	Prob.		
1st generation							
Max. temp.	-0.673	-2.39	1.53	-1.57	0.18	52.94**	97.70 %
Min Temp.	-0.805	-0.30	1.60	-0.19	0.86		
RH%	-0.523	-1.90	0.34	-5.62	0.00		
Parasitoid	0.500*	0.34	0.73	0.46	0.67		
2nd generation							
Max. temp.	-0.437	5.98	20.88	0.29	0.80	7.10	93.42
Min Temp.	-0.273	2.06	18.62	0.11	0.92		
RH%	0.176	3.26	3.39	0.96	0.44		
Parasitoid	0.956**	22.93	5.36	4.28	0.05		
3rd generation							
Max. temp.	0.789**	-4.32	13.90	-0.31	0.77	6.71	84.29
Min Temp.	0.813**	16.67	15.13	1.10	0.32		
RH%	-0.105	2.81	1.52	1.85	0.12		
Parasitoid	-0.668	4.56	2.74	1.66	0.16		

* Significant relation **Highly significant relation

Table (2): Statistical analysis for simple correlation and multicapsid regression to investigate the effect of abiotic and biotic factors on *Lindingaspis floridana* total population during 3 generations in the 2nd year (2016-2017).

Factors	Simple correlation	Regression values				"F" value	Explained variance %
	"r"	"b"	s.e.	"t"	Prob.		
1st generation							
Max. temp.	0.083	8.53	9.15	0.93	0.45	0.89	64.16
Min Temp.	-0.143	-23.83	36.61	-0.65	0.58		
RH%	-0.153	-3.86	6.85	-0.56	0.63		
Parasitoid	0.444	-3.26	8.66	-0.38	0.74		
2nd generation							
Max. temp.	-0.607	-3.28	2.27	-1.44	0.19	42.80	95.54
Min Temp.	-0.727	0.48	2.72	0.18	0.86		
RH%	-0.175	0.70	0.39	1.79	0.11		
Parasitoid	0.673*	4.06	0.49	8.28	0.00003		
3rd generation							
Max. temp.	0.885**	-2.96	0.34	-8.65	0.07	1711.20	99.9
Min Temp.	0.916**	8.63	0.38	22.44	0.03		
RH%	0.031	-0.98	0.06	-15.60	0.04		
Parasitoid	0.186	4.99	0.28	17.70	0.04		

* Significant relation ** Highly significant relation

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