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Ecological studies on the wax scale insect *Waxiella mimosae* (Signoret) and the mealybug *Trabutina serpentina* (Green) infested Tamarix trees in Giza Governorate

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ABSTRACT

Ecological studies have been conducted on the population of the wax scale insect *Waxiella mimosae* (Signoret) and the mealybug *Trabutina serpentina* (Green) infesting Tamarix trees for 2 successive years (2016-2017) and (2017 and 2018) in Giza Governorate. Obtained results showed that both insects' population were higher in the 1st year than the 2nd one. *W. mimosae* recorded about 3-4 peaks of total population in 1st and 2nd year, respectively. The highest population of insects was recorded in September 2016, and the nymphal stage was the most numerous than other stages. The highest rate of increase was recorded in the 1st year with 2.97 with temperature ranged between (15.13-24.00°C) and average relative humidity of 51.93%. It recorded 4 annual overlapping generations/year, the longest generations recorded 195 and 165 days from October till April in both years. Two parasitoids (with a new record parasitoid in Egypt) and two predators were recorded associated with *W. mimosae* in low densities that appeared mostly in spring months. The effect of mean temperature was significant on the insect population but the relative humidity effect was insignificant in both years. *T. serpentina* recorded 4 and 3 peaks in the 1st and 2nd year, respectively. The highest population was in 1st December and 1st February in the 1st and 2nd year, respectively. The highest rate of increase was recorded in 1st year with 2.5 in mid-January 2017. Whereas, it recorded 3 annual overlapping generations the longest one was from mid-December till 1st of May 2017 with 135 days in the 1st year while in the 2nd year each one of the 3 overlapping generations recorded 75 days. The effect of the three studied weather factors was insignificant. One associated parasitoid was recorded in low density.

Keywords: *Waxiella*, *Trabutina,* Population fluctuation, generation, Tamarix.

Plant Protection

INTRODUCTION

Waxiella mimosae (Signoret) (Hemiptera: Coccidae) is a wax scale insect has a very thick layer of wax, dirty white color (Ben-Dov, 1986) secreted to protect insect bodies from different weather factors and attack of natural enemies, it is mainly distributed in Afrotropical regions De Lotto (1971). *Trabutina serpentina* (Green) (Hemiptera: Pseudococcidae) is a mealybug with a soft body covered with a cottony wax layer. The adult female produces a long, cottony, tubular ovisac on the shoots and small branches of its host. It often makes a loop and the apex of the body protrudes from the ovisac. The eggs are pallid yellow when first laid, but turn red just before hatching and they are widespread from Italy to northeastern China (Danzig and Miller, 1996). Almost there is no previous ecological investigation implemented on this species in Egypt, it was reported in Egypt by Bodenheimer (1929), Ben-Dov (1994) and Danzig and Miller (1996).

Both insects secret a large amount of honeydew which is consider a suitable media for the growth of the black sooty mold fungi which covered the upper surface of plant leaves and led to difficulty in respiration and photosynthesis operations Attia (2003). Furthermore, they suck a large amount of plant sap causing plant weakness, leaves turn to yellow then fall. Both insects were found infesting *Tamarix* sp. trees which are a desert plant native to drier areas of Africa and Eurasia Baum (1978). It is an evergreen tree, can grow 18 meters in height, it can be used as an ornamental plant, windbreaks, carpentry and shade trees. Tamaxix trees can be planted to mine salts, then be used in the production of fuel and fertilizer. It is tolerant for saline soils and it was used in China in anti-desertification program Zhiliang (2007). In this paper, the population fluctuations of both insects were studied throughout 2 successive years (2016-2017) and (2017-2018). Moreover, the effects of the corresponding weather factors were studied, number and durations of generations in a year were detected. Notes about the associated predators and parasitoids were mentioned.

MATERIAL AND METHODS

Collecting samples

Samples were taken biweekly for two successive years (2016-2017) and (2017-2018) started in August 2016 till mid-July 2018 from Tamarix trees located in Giza Governorate. Each sample consisted of 10 branches about 15 cm long replicated 3 times. Samples were taken from 10 trees almost similar in shape and size and there was no chemical treatment was applied during the present study. Samples were collected randomly in polyethene bags and transferred to the laboratory to count the alive different stages (nymphs, adults and gravid females) of both insects. No insecticides were applied before and during the present study. The rate of increase was calculated by dividing the total number of alive populations among each count over the total numbers of the previous one in both years which represents the most preferable time for both insects Bodenheimer (1951).

Associated predators and parasitoids identifications:

Larvae, pupae and adults of predators were found associated with insects during field sampling. The premature stages (larvae and pupae) were separated until the emergence of adult individuals and identified by Dr. Emad El-Din Baberis a Senior Researcher in the Insect Classification and Surveying Department of Plant Protection Research Institute, ARC, Egypt. While parasitoids were collected during the examination of samples in Laboratory by aid of stereomicroscope where pupa of parasitoids was separated and kept in glass test tubes (kept in normal laboratory conditions) until emergence of adult parasitoids then identified by Prof. Dr. Shabaan Abd Rabou Chief Researcher in Scale Insects and Mealybugs Department, Plant Protection Research Institute, ARC, Egypt.

Number of generations and annual durations:

The number and duration of annual field generations were detected on Tamarix trees in Giza Governorate for both insects throughout the two years (2016-2017) and (2017-2018). The annual field generations were estimated by data of the accumulated half monthly counts of mean alive nymphs of both insects according to Iacob (1977).

Effect of certain weather factors on the population of *W. mimosae* and *T. serpentina*:

Effect of certain weather factors; mean minimum, mean maximum temperatures and mean relative humidity were estimated on the population of both insects under investigation in Giza Governorate, taking in consideration studying different weather factors 15 days before the 1st date of sampling. The meteorological data were obtained from the Egypt Weather Underground https://www.wunderground.com/global/EG.html

Statistical analysis.

Simple correlation (r) and regression (b) values were calculated to study the effect of the abiotic factors which are the main weather factors; daily maximum temperature (D. Max. Temp. °C), nightly minimum temperature (N. Mini. Temp. °C) and daily mean relative humidity (D.M.RH. %) on both insects on Tamarix trees. Statistical analysis procedures were conducted in two steps, the first one to investigate the effect of each factor separately 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 combined effects of the three tested factors as a group on the changes of the population density expressed a percentage of explained variance (E.V.%) and the variance ratio (F value) was used as a measure of significance. ANOVA was performed with the MSTAT-C Statistical Package (Michigan State University, USA).

RESULTS AND DISCUSSION

I-Population fluctuations of *Waxiella mimosae* (Signoret) different stages infesting *Tamarix* sp. in Giza Governorate (2016-2017) and (2017-2018):

Results illustrated in Figs. (1and 2) showed that, the population of *W. mimosae* was higher in the 1st year than the 2nd one where the averages of total population were 78.89 and 48.06 individuals/10 branches, respectively.

A) Nymphal stage:

Results revealed that nymphs were more abundant in summer and autumn months and decrease sharply in the rest of the year. They recorded 3 peaks in 1st year (2016-2017) the highest one was 310.83 nymphs/10 branches in 1st September 2016 followed by 2 smaller peaks with 15.08 and 63.75 nymphs/10 branches in mid-November and 1st June 2016, respectively. Almost, the same trend was recorded in the second year with fewer numbers 67.00, 17.27 and 77.60 nymphs/10 branches in 1st October, 1st December 2017 and 1st May 2018, respectively.

B) Adult females:

It was clear that adult females almost disappeared in both years between March and June. Data declared that there were 3 peaks of adult females in the 1st year (2016 -2017) with 41.67, 15.06 and 28.67 adult females/10 branches in 1st September, 15th

November and 1st July 2017, respectively**.** While in the second year, they recorded 2 peaks only in 1st December 2017 and mid-July 2018 with 37.27 and 23 adult females/ 10 branches, respectively.

C) Gravid (ovipositing) females:

It was obvious that gravid females have recorded 2 peaks in 1st year on 15th of August 2016 and 1st April 2017 with 35.71 and 26.00 gravid females/ 10 branches. On the other hand, they gave 4 peaks in the second year in 1st September, 1st November 2017 and 1st June with 45, 10, 34 and 22 gravid females/10 branches. It was clear that the gravid females completely disappeared in both years in the intervals between November and February of the next year (winter months).

D) Total population:

Results revealed that there were 3 peaks of total population in 1st year, the highest one recorded 375.85 individuals/ 10 branches in 1st September 2016 while the 2 other peaks were 77.83 and 63.75 individuals/ 10 branches in mid-November and 1st June, respectively. While, in the next year results showed that there were 4 peaks of total population recorded in 1st October, 1st December, 1st March and 1st May with 67, 54.55, 41.82 and 77.60 individuals/ 10 branches, respectively. The rate of increase which represent the most preferable time for the insects, in the 1st year the highest rate of increase was recorded in 1st September and mid-November with 1.61 and 2.97, respectively. The temperature ranged between (19.63-29.00 ºC) and the average relative humidity was 54.63%. However, in the 2nd year the rates of increase were in mid-August and mid-April with 1.33 and 1.55, respectively with temperature ranged between (22.13-32.31ºC) and the average of the relative humidity was 49.96%,

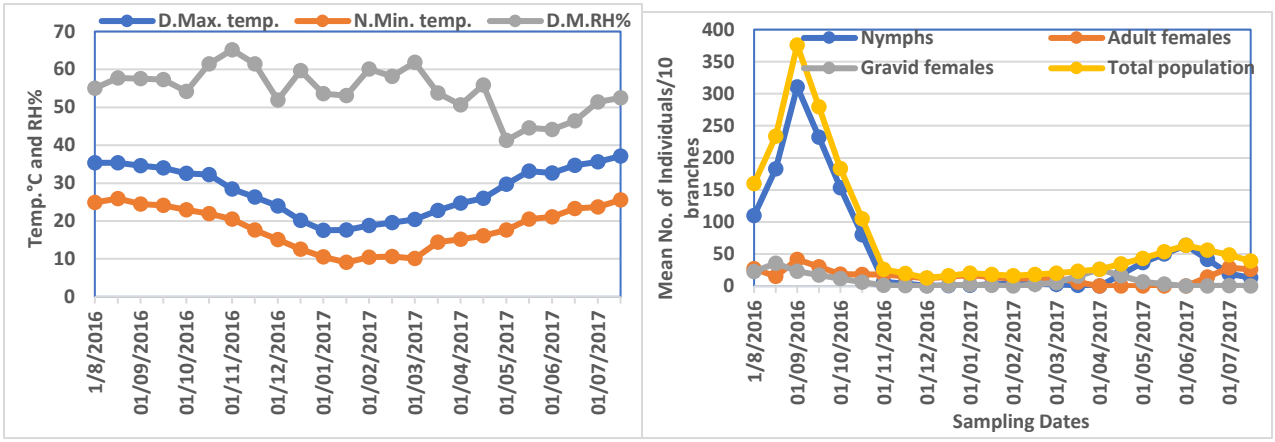


Fig. (1): Population fluctuations of *W. mimosae* different stages infesting Tamarix trees with the corresponding main weather factors in Giza Governorate 2016-2017**.**

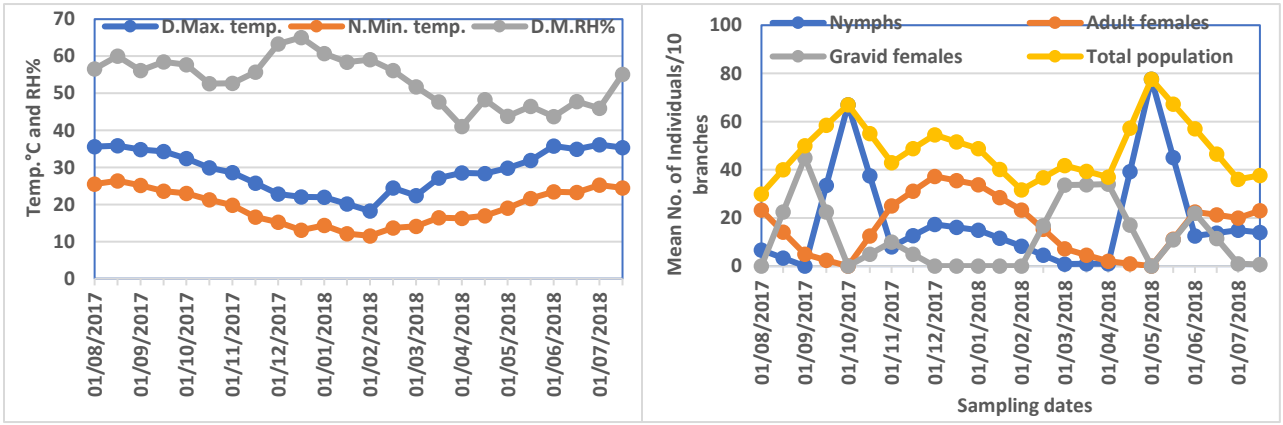


Fig. (2): Population fluctuations of *W. mimosae* different stages infesting Tamarix trees with the corresponding main weather factors in Giza Governorate 2017-2018.

2- Associated parasitoids and predators:

Ecological studies showed that there were two species of parasitoids associated with *W. mimosae*, which were recorded during the two successive years of study. The parasitoids have been defined as

1. *Aloencyrtus coelops* (Waterston, 1917) New record in Egypt (El-Sahn and Azazy 2020)
2. *Blastothrix erythostetha* Walker, 1847

Hymenoptera: Chalcidoidea: Encyrtidae (Evans and Abd-Rabou 2013)

For the predators: Two predators were recorded associated with *W. mimosae*

1-Larvae of the green lacewings *Chrysoperla carnea* (Stephens) (Neuroptera :Chrysoperlidae)

2-Adults of *Scymnus syriacus* Marseul (Coleoptera: Coccinellidae)

The parasitoids and predators were found in few numbers mainly in the spring months.

3- Number and duration of generations:

Data in Table (1) and illustrated in Fig. (3) showed that *W. mimosae* recorded 4 annual overlapping generations in the 1st year 1st generation started from the beginning of August and lasted till mid-October with 75 days, 2nd generation started in the 1st of October till the mid-April 2017, it was the longest generation with 195 days. For both the 3rd and 4th generations, they were the shortest generations and lasted for 60 days starting from 1st April till 1st June and from mid-May till the end of the year in July, respectively.

Almost, the same trend was recorded in the second year. As the insect recorded 4 overlapping generations with almost the same intervals as in the 1st year. The 1st generation was the shortest one started at the beginning of September and continued till 1st of November with 60 days, the 2nd generation was the longest one, started from mid-October till 1st of April with 165 days and the 3rd one recorded 60 days from mid-March till mid-May. For the fourth generation, it started from 1stMay till mid-July with 75 days long.

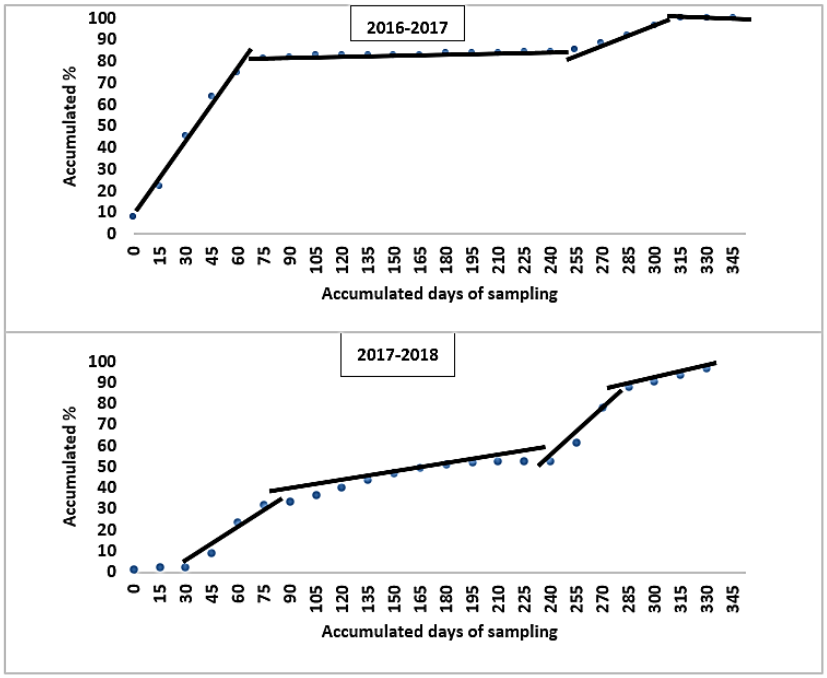


Fig. (3): Numbers and Durations of *W. mimosae* generations on Tamarix trees during 2016-2017 and 2017-2018 in Giza Governorate

Table (1): Numbers and Durations of *W. mimosae* generations on Tamarix trees during 2016-2017 and 2017-2018 in Giza Governorate.

Generation No.	Generation time	Generation duration' in days
2016-2017		
1st generation	From 1st August till mid-October	**75 days**
2nd generation	From 1st October till mid- April 2017	**195 days**
3rd generation	From 1st April till 1st June	**60 days**
4th generation	From mid-May till mid-July	**60 days**
2017-2018		
1st generation	From 1st September till 1st November	**60 days**
2nd generation	From mid-October till 1st April 2018	**165 days**
3rd generation	From mid-March till mid-May	**60 days**
4th generation	From 1st May till mid-July	**75 days**

4- Effect of three weather factors on the total population of *W. mimosae* during 2016-2017 and 2017-2018 in Giza Governorate:

The effect of three weather factors was studied on the mean total population of *W. mimosa.* Results in Table (2) showed that:

A) Effect of mean maximum temperature:

It was clear that maximum temperature in the 1st year had a hardly positive significant effect on the population of the wax scale insect *W. mimosae* with a simple correlation coefficient r= 0.578*. While, in the second year it had a nonsignificant effect.

B) Effect of mean minimum temperature:

Almost the same trend was recorded where the mean minimum temperature had a hardly positive significant effect on the insect total population with r= 0.639*. But there was a non-significant effect in the second year.

Table (2): Effect of three weather factors on the population of *W. mimosae* in two successive years (2016-2017) and (2017– 2018) in Giza Governorate.

Weather factors	Simple correlation	Regression values				Explained variance %
	"r"	"b"	S. E ±.	"t"	Prob.	
2016-2017						
Max. temp.	0.578*	0.040	0.012	3.319	0.003	**41.1%**
Min Temp.	0.639*	0.038	0.010	3.894	0.001	**"F" value 6.35**
RH%	0.145	0.009	0.013	0.686	0.499	
2017– 2018						
Max. temp.	0.144	0.068	0.100	0.682	0.582	**10.9%**
Min Temp.	0.131	0.052	0.085	0.620	0.541	**"F" value 0.25**
RH%	-0.160	-0.087	0.115	0.762	0.454	

C) Effect of mean relative humidity:

The mean relative humidity had a non-significant effect in both years under investigation.

The explained variance (EV%) was significant in the first year with 41.1 % and F value = 6.35 while, in the second year it was no significant relation with E. V.% was 10.9%.

Obtained Results showed that *W. mimosae* recorded about 3-4 peaks of total population in 1st and 2nd year, respectively. The most abundant population was recorded in September 2016. These results were in agreement with Hassan *et al.* (2012) who stated that *Ceroplastes floridensis* (Coccidae) recorded three peaks, on orange in April, June and the third was in November. The third peak was the highest one while the first was the lowest. While El-Imery (1985) found only two peaks of the population of the Florida wax scale insect *C. floridensis* on grapefruit. Also, results showed that the highest rate of increase was recorded in the 1st year with 2.97 with averages maximum, minimum temperature and average relative humidity 24.00, 15.13ºC and 51.93%. It recorded 4 annual overlapping generations; the longest generations recorded 195 and165 days from October till April in both years. This result was in disagreement with Ben-Dov and Guerrieri (2009) who recorded 2 annual generations of *Waxiella*. Adult females appeared in March and reproduction of 2nd generation continued in October. Also, Bakry (2018) stated that *W. mimosae* infesting sunt trees in Luxor Governorate recorded 2 overlapping generations/ year. The spring generation was the highest generation in population. The total population density of *Waxiella* was more abundant in spring and autumn.

Two parasitoids (with a new record parasitoid in Egypt) and two predators were recorded associated with *W. mimosae* in low densities appeared mostly in spring months. Ben-Dov and Guerrieri (2009) recorded the parasitoid *Anicetus africanus* (Girault) (Hymenoptera, Encyrtidae) newly recorded from Israel associated with *W. mimosae.* Badary and Abd-Rabou (2011) mentioned that the pteromalid parasitoid, *Scutellista caerulea* (Fonscolombe) (Hymenoptera: Pteromalidae) is one of the most effective parasitoids associated with soft scale insects in Egypt and was found emerged from *W. mimosae* (Signoret). Evans and Abd-Rabou (2013) found about seven parasitoids associated with *W. mimosa*e. El-Sahn and Azazy (2020) found that the parasitoid *Aloencyrtus coelops* was recorded for the first time in Egypt associated with the wax scale insect *W. mimosae* in Giza Governorate.

The effect of mean temperature was significant on the insect population but relative humidity effect was insignificant in both years. Ben-Dov and Guerrieri (2009) mentioned that this species was found in very arid climate, where mean temperature 39.9ºC in July and 20.8ºC in January.

II- Population fluctuations of the different stages of *Trabutina serpentina* (Green) infesting *Tamarix* sp. in Giza Governorate (2016-2017) and (2017-2018). This study was considered a pioneer study on the ecological aspects *of T. serpentina* in Egypt. It was conducted during two successive years (2016-2017) and (2017-2018) in Giza Governorate. Results illustrated in Figs (4 and 5) showed that the total population of *T. serpentina* was relatively low in both years, But it was higher in the first year than in the 2nd year where the total population mean was 29.20 and 16.76 individuals/10 branches, in both years, respectively.

Also, data revealed that the insect is not found all over the year where it disappeared in both years from the beginning of August till mid-October.

A) Nymphal stage:

The nymphal stage showed 4 peaks of abundance in the 1st year 2016-2017 in 1st December 2016, 1st February 2017, 1st April and 1st July with 23.00, 13.33, 25.00 and 31.43 nymphs/10 branches. While there were two peaks in the 2nd year recorded in 1st November 2017 and 1st February 2018 with 22.00 and 83.33 nymphs/10 branches, respectively.

B) Adult females:

In the 1st year it was clear that there were 2 peaks in 1st December and 1st July with 20.00 and 5.71 adult females/10 branches. But for the second year the adult females were barely found with very few numbers all over the year 2017-2018.

C) Gravid (Ovipositing) females:

The gravid females recorded the highest population in the 1st year where it recorded 4 peaks with 43.33, 23.33, 62.78 and 17.17 gravid females/ 10 branches in 1st November 2016, 1st February 2017, 1st May and 1st July, respectively. It was clear that gravid females completely disappeared in the second year except in the recorded peaks intervals where it recorded 2 peaks in 1st of November 2017 and 1st May 2018 with lower numbers than the 1st year with 12.00 and 10.00 gravid females/10 branches, respectively.

D) Total population:

There were four peaks were recorded in the 1st year in 1st December 2016, 1st February 2017, 1st May and 1st July with 71.00, 36.67, 67.78 and 54.29 individuals/10 branches, respectively. On the other hand, there were 3 peaks in the 2nd year in 1st November 2017, 1st February 2018 and 1st May with 34.00, 83.33 and 10.00 individuals/10 branches, respectively, mainly the 2nd and 3rd peaks have consisted of nymphal stage only as the other stages were disappeared, that's why the curves of population in figure (5) seemed one curve but actually, the curve of nymphs and total population were identical.

In spite of the population of *T. serpentina* was relatively low in both years but there were preferable times for its population where it recoded high rates of increase in both years. In the first year, the highest rates of increase recorded 1.95, 2.5, 2.02 and 1.86 in 1st November, mid-January, mid-April and mid-June, respectively. Temperature ranged between (17.36 - 27.62°C) and average relative humidity was 53.55%.

Almost the same trend was recorded in the second year where rates of increase recorded 1.87 and 1.75 in 1st November and 1st January. Temperature ranged between (17.09-25.28°C) and the average relative humidity was 56.72%.

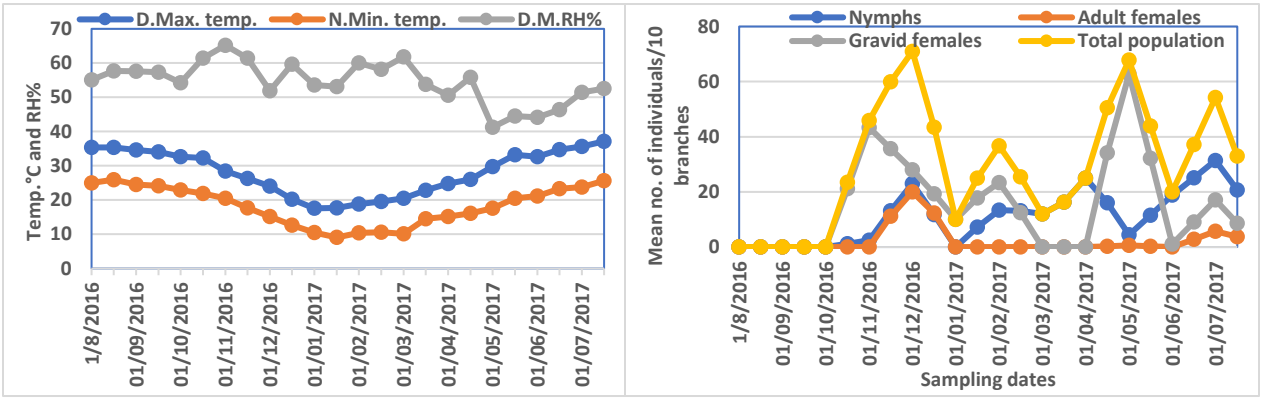
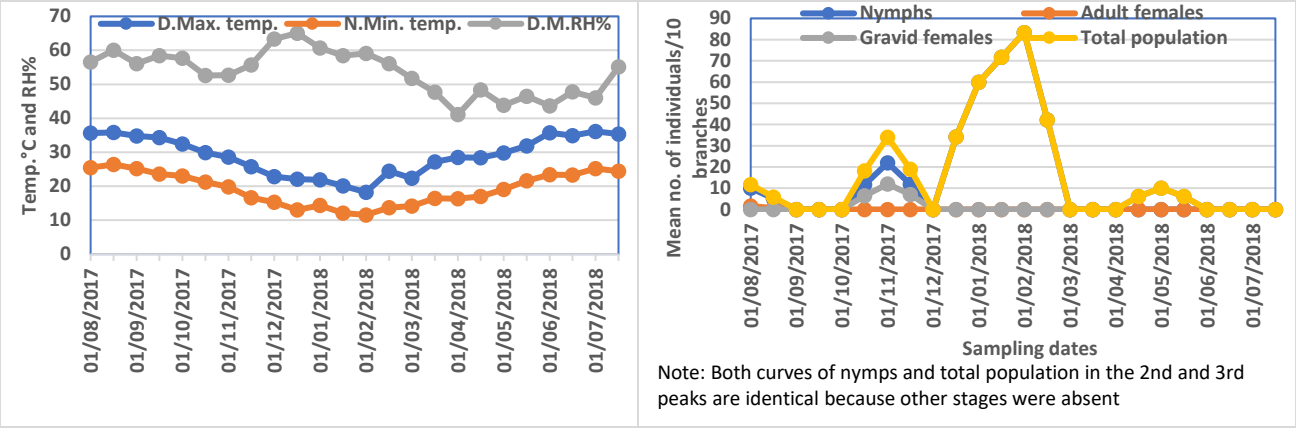


Fig. (4): Population fluctuations of the different stages of *Trabutina serpentina* (Green) infesting *Tamarix* sp. in Giza Governorate (2016-2017).



Note: Both curves of nymps and total population in the 2nd and 3rd peaks are identical because other stages were absent

Fig. (5): Population fluctuations of the different stages of *Trabutina serpentina* (Green) infesting *Tamarix* sp. in Giza Governorate (2017-2018).

2- The associated parasitoid:

One parasitoid, *Leptomastix dactylopii* Howard (Hymenoptera: Chalcidoidea: Encyrtidae) was found associated with *T. serpentina* in a very few numbers.

3- Durations and number of generations:

Results in Table (3) and illustrated in Fig. (6) showed that *T. serpentina* recorded 3 overlapping generations in both years:

In the 1st year, the 1st generation started from 1st of November 2016 till 1st January 2017 with 60 days, the 2nd generation was the longest one with 135 days started from mid-December till 1st May 2017. While the 3rd generation was 90 days started in mid-April till the end of the year. In addition, in the second year, the insect recorded 3 overlapping generations, each generation recorded 75 days. The 1st one started in the beginning of August and extended till mid-October 2017, while the 2nd generation was from 1stOctober till mid-December. For, the 3rd generation began from 1stDecember till mid-February.

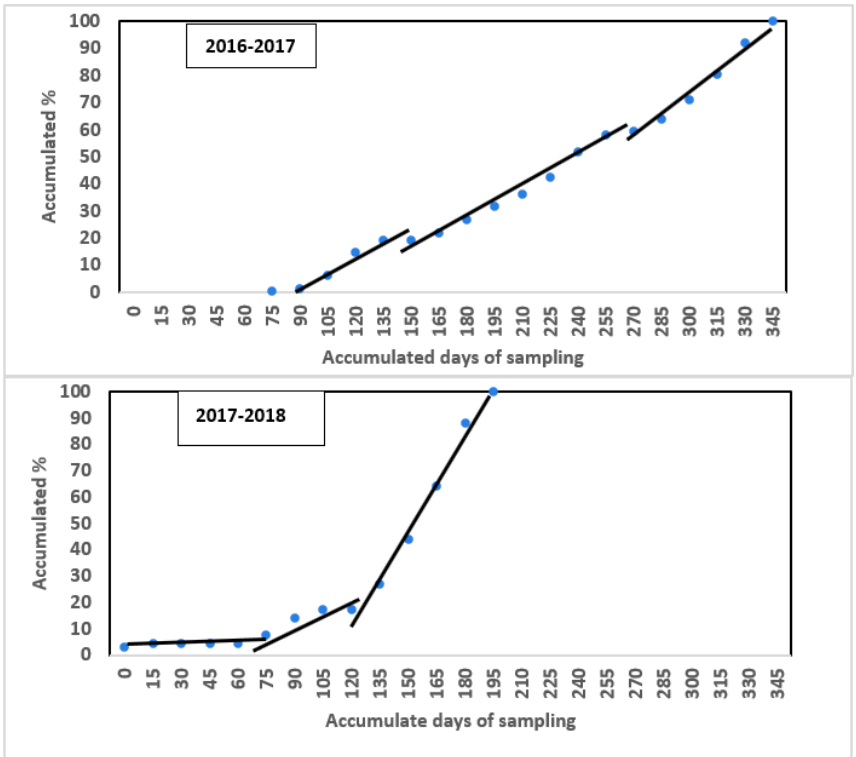


Fig. (6): Numbers and Durations of *T. serpentina* generations on *Tamarix* trees during 2016-2017 and 2017-2018 in Giza Governorate.

Table (3): Numbers and Durations of *T. serpentina* generations on *Tamarix* trees during 2016-2017 and 2017-2018 in Giza Governorate.

Generation No.	Generation time	Generation duration' in days
2016-2017		
1st generation	From 1st November till 1st January 2017	60 days
2nd generation	From mid-December till 1st May	135 days
3rd generation	From mid- April till mid-July	90 days
2017-2018		
1st generation	From 1st August till mid-October	75 days
2nd generation	From 1st October till mid-December	75 days
3rd generation	From 1st December till mid-February	75 days

4-Effect of different weather factors:

Statistical analysis in Table (4) showed that that the correlation between the insect population' and each weather factor from the three studied weather factors (maximum, minimum temperature and relative humidity) were so weak where in the first year the coefficient factor of correlation " r " were 0.300, 0.304 and -0.158 for the 3 weather factors, respectively. Also, the combined effect of three weather factors was insignificant with F value =1.110 and E.V = 14.28%. Also, in the 2nd year the relation was negative and not significant for maximum and minimum temperatures where "r" values were -0.679 and -0.598, respectively. While the relative humidity was positive insignificant with "r" =0.384. On contrary, the effect of the combined three weather factors were significant with F value = 8.253 and E.V. = 55.31%. Which indicate that the effect of weather factors was so weak and that's maybe because the insect secrets a tubular cottony ovisac which consider a shelter for the insect where it exists inside this tubular secretion.

Table (4): Effect of three weather factors on the population of *T. serpentina* in two successive years (2016-2017) and (2017–2018) in Giza Governorate.

Weather factors	Simple correlation	Regression values				Explained variance %
	"r"	"b"	S. E ±.	"t"	Prob.	
2016-2017						
Max. temp.	0.300	4.103	4.954	0.828	0.417	14.28%ns
Min Temp.	0.304	-5.624	5.635	-0.998	0.330	F value 1.110
RH%	-0.158	-0.389	1.030	-0.378	0.710	
2017– 2018						
Max. temp.	-0.679	-5.636	3.902	-1.444	0.164	55.31% *
Min Temp.	-0.598	3.294	4.388	0.751	0.462	F value 8.253
RH%	0.384	0.331	0.808	0.410	0.686	

Results showed that *T. serpentina* recorded 4 and 3 peaks in the 1st and 2nd year, respectively. The highest population was in 1st December and 1st February in the 1st and 2nd years, respectively. The highest rate of increase was recorded in 1st year with 2.5 in mid-January 2017. Whereas, it recorded 3 annual generations the longest one was from mid-December till 1st of May with 135 days in the 1st year while in the 2nd year each of the 3 overlapping generations recorded 75 days. The effect of the three studied weather factors was insignificant. One associated parasitoid was recorded in low density. Trjapitzin (1989) mentioned that there were 6 parasitoids associated with *T. serpentina* and related to Family Encyrtidae. Evans and Abd-Rabou (2013) found *Anagyrus kamali* Moursi associated with *T. serpentina.*

Almost there are no previous ecological studies on *T. serpentina* in Egypt or around the world, the reviews cited were just about systematic taxonomy or location survey. Bodenheimer (1929), Ben-Dov (1994) and Danzig and Miller (1996) mentioned that *T. serpentina* was found in Egypt infesting *Tamarix* sp. Trees. Danzing and Miller (1996) mentioned that the genus *Trabutina* includes five species, *T. crassispinosa* Borchsenius, *T. elastica* Marchal, *T. mannipara* (Hemprich and Ehrenberg), *T. serpentina* (Green), and *T. tenax* (Borchsenius). All occur in arid zones of the Palearctic and are restricted to *Tamarix*. Two species, *T. mannipara* and *T. serpentina*, are widespread from Italy to northeastern China.

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Conflict of Interest: The authors declare no conflict of interest

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دراسات إيكولوجية على الحشرة الشمعية (Signoret) *Waxiella mimosae* وحشرة البق الدقيقي *Trabutina serpentina* (Green) اللتان تصيبا أشجار الأثل *Tamarix* sp. بمحافظة الجيزة

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الملخص العربي

تمت بعض الدراسات الإيكولوجية على حشرتي (Signoret) *Waxiella mimosae* وحشرة البق الدقيقي *Trabutina serpentina* لعامين متتالين بمحافظة الجيزة. أوضحت النتائج أن تعداد الحشرتين كان أعلى في السنة الأولى عن الثانية وأعطت الحشرة الشمعية *W. mimosae* 3-4 قمم في التعداد الكلي للحشرة في سنتى الدراسة على التوالي. وكانت أكثر الفترات بها مرتفع في سبتمبر 2016. وأعطت الحوريات أعلى تعداد أكثر من الأطوار الأخرى. كان أعلى معدل لزيادة التعداد في السنة الأولى بمقدار 2.97 وكانت الحرارة العظمى والصغرى والرطوبة النسبية المصاحبة 24 ، 15.13 ºم و51.93%، على التوالي. وسجلت الحشرة 4 اجيال متداخلة في سنتى الدراسة أعلاها كان 195 و 165 يوم من أكتوبر وحتى إبريل خلال سنتى الدراسة .
كما سجل طفيلين (أحدهم تم تسجيلة على الحشرة الشمعية *W. mimosae* لأول مرة في مصر) ومفترسين لكن تواجدوا بأعداد قليلة وكان تواجدهم في موسم الربيع. كان تأثير العوامل الجوية من حرارة عظمى وصغرى معنوى في السنة الأولى بينما كان تأثير الرطوبة النسبية غير معنوى خلال سنتى الدراسة. بالنسبة للحشرة الثانية *T. serpentina* فقد سجلت3-4 قمم فى السنة الثانية والأولى على التوالى. وسجل أعلى تعداد في بداية شهر ديسمبر 2016 ب71 حشرة/10 أفرع في السنة الأولى أما بالنسبة للسنة الثانية فقد سجلت 83.33 فرد/10 أفرع في شهر فبراير 2018. كان أعلى معدل في زيادة العداد سجل في السنة الأولى بمقدار 2.5 في منصف يناير 2017. كما سجل 3 أجيال متداخلة للحشرة في سنتى الدراسة وكان اطول الأجيال في الفترة من منتصف ديسمبر وحتى اول مايو في السنة الأولى حيث سجل135 يوماً أما في السنة الثانية فقد كانت الأجيال متساوية حيث سجلت 75 يوماً لكل جيل من الأجيال الثلاثة المتداخلة. كان تأثير العوامل الجوية خلال سنتى الدراسة غير معنوى. وتم تسجيل طفيل واحد بأعداد قليلة على الحشرة.

الكلمات المفتاحية: الحشرة الشمعية - وحشرة البق الدقيقي - تعداد الحشرة - أشجار الأثل