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Population denesity of *Aleuroclava psidii* (Hemiptera: Aleyrodidae) on guava in Qaliobiya Governorate, Egypt

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Abstract:

Guava (*Psidium guajava* L) is a new host to the whitefly, *Aleuroclava psidii* (Singh) (Hemiptera: Aleyrodidae) at Qaliobiya Governorate. The high infestation by *A. psidii* causes serious damage and noticeable reduction in quantity and quality of the yield. The present investigation carried out to study the population dynamics of *A. psidii* nymph in relation to the different phonology stages of the defoliated and prune guava trees. The overall means of the first year was 4285 individuals compared with the overall mean count of the second year which was 2449 individual. The whitefly, *A. psidii* have two periods of activities (low and high activity periods) on guava trees. Also, predators and parasitoid will be surveyed and identified. The relationship between the nymph population, three climatic factors (minimum, maximum temperatures and RH %) and plant age were studied.

Introduction

World production statistics for guava are unavailable; however, the guava has major commercial importance in India, Egypt, South Africa, Brazil, Colombia and the Caribbean region. The fruits are eaten fresh or as preserves and processed for use in dairy and baked products. The guava fruit is rich in vitamin C, carbohydrates, proteins, calcium, phosphorus, vitamin A, pantothenic acid, riboflavin, thiamine and niacin and is also a commercial source of pectin and oil (Richard, 2005). In normal guava orchards their ordinary phonological phases are as following, dormancy period in winter, defoliation period on March, shoot growth and flowerage are through April and May and finally get yield on September and October. The guava trees (Psidium *guajava* L) can grow and produce in any season, so they can be harvested out of the period of high competition marketing (summer) (Nava *et al.*, 2014). As most fruit tree species, the guava tree shows different phonological stages through out its vegetative period in response to environmental conditions (Salazar and Burguera, 2006).

The guava has social and economic importance but requires technological advancements to optimize growth (Hojo *et al.*, 2007). Guava producers handle the guava tree to get higher yield, fruit quality and distribute the harvest throughout the year. Among the handling methods, the pruning time stands out as an important

management practice. The implementation of scheduled pruning promotes better circulation of cultural practices in the orchard, extends the harvest season, and adds market flexibility (Ramos *et al.,* 2010). According to Hojo *et al.* (2007), this is an economically viable practice because it can allow the harvest at precise periods of lower market supply.

Guava trees are considered as a new host for the whitefly, *Aleuroclava psidii* (Singh) (Hemiptera: Aleyrodidae) which discovered on *Psidium* sp. (Myrtaceae) in Qaliobiya Governorate Egypt (Abd-Rabou and Evans, 2014). The high infestation by *A. psidii* causes serious damage and noticeable reduction in quantity and quality of the yield. It infests underside surface leaf (Khalaf *et al.,* 2010) and causing many problems because they have piercing mouth parts which allow them to suck plant sap causing weakness of the tree and yellowish of the leaves. Also, the whitefly excretes large amount of honey dew as a result of large amount of plant sap they suck which considered a suitable medium for growth of sooty mould fungi which cover the upper surface of leaves and prevent the photosynthesis and respiration.

The aim of this work was study population dynamics of the whitefly, *A. psidii* on guava in Qaliobiya Governorate in relation to plant phenology during two years of study.

Materials and methods

The examined orchard was about two feddans in Qaliobiya Governorate whose phenological stages illustrated in (Figure,1).

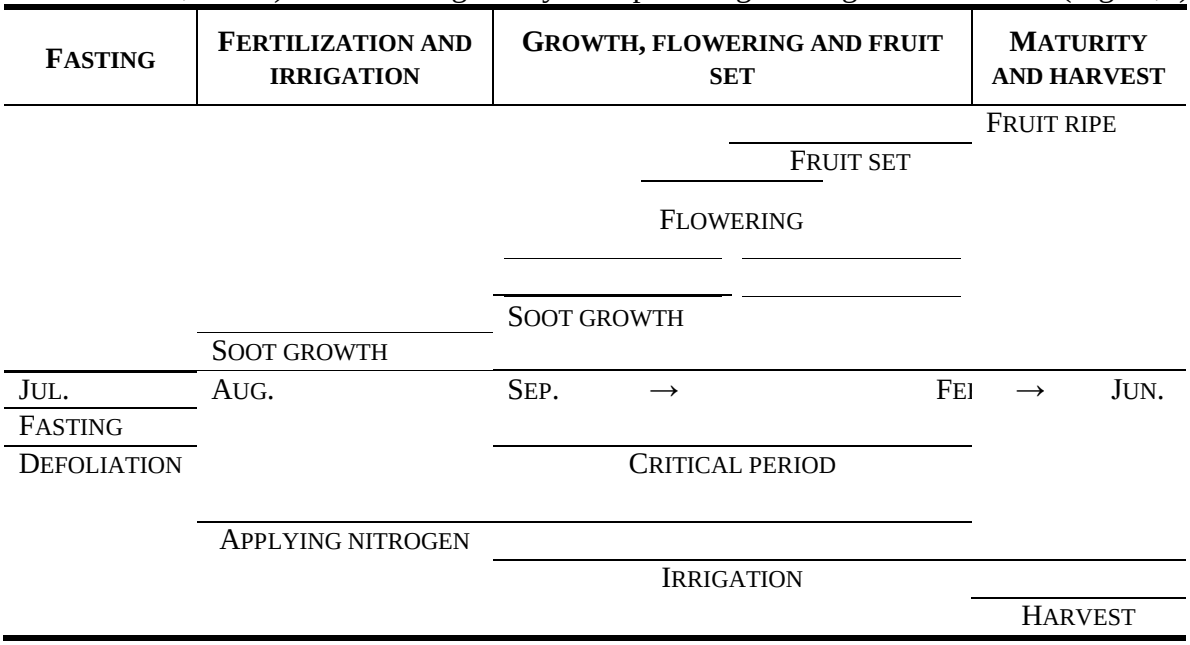

Figure (1): Annual crop cycle of guava and its control by management in Egypt

Samples were taken biweekly of 120 infested leaves (40 leaves x 3 replicates). The leaves were kept in paper bag then transferred to the laboratory to be examined by the aid of stereomicroscope binocular. Alive whitefly, *A. psidii* nymphs only were counted. Weather factors namely maximum, minimum temperatures and mean % relative humidity (RH%) was obtained from the Egypt-Weather Underground *https://www.wunderground.com/global/EG.html*. The effect of tested weather factors on this insect activity was adopted by using the simple correlation, regression coefficient and the partial regression in SAS Institute (1988) Program. The studied pest, the associated predators and parasitoid were collected and identified by Prof. D. Shaaban Abd Rabou, Scale Insect and Mealy bugs Research Department, Plant Protection Research Institute.

Results and discussion

1.Population dynamics of the whitefly, *Aleuroclava psidii* nymphal stage:

Results illustrated in Figures (2 and 3), the number of nymphs of *A. psidii* recorded one peaks per a year. During the two years of study they recorded on mid-April with 1021 and 506.6 nymphs/leaf, respectively.

2.Activity periods of *Aleuroclava psidii* on guava:

Each year of study was divided to two periods of activity, low and high activity periods.

2.1.Low activity period:

Data illustrated in Figures (4 and 5) there was a low activity period per a year of study these periods started from (mid - October till first March) with a peak of 108.67 on first of January and (first of November till first March) with 74 nymphs/leaf recorded on mid December during the two years of study, respectively, through these periods of activity the population increase in stable range because the tree is vigor and full off plant sap (green shoot, flowering and fruit setting periods) however temperatures were highly decreased.

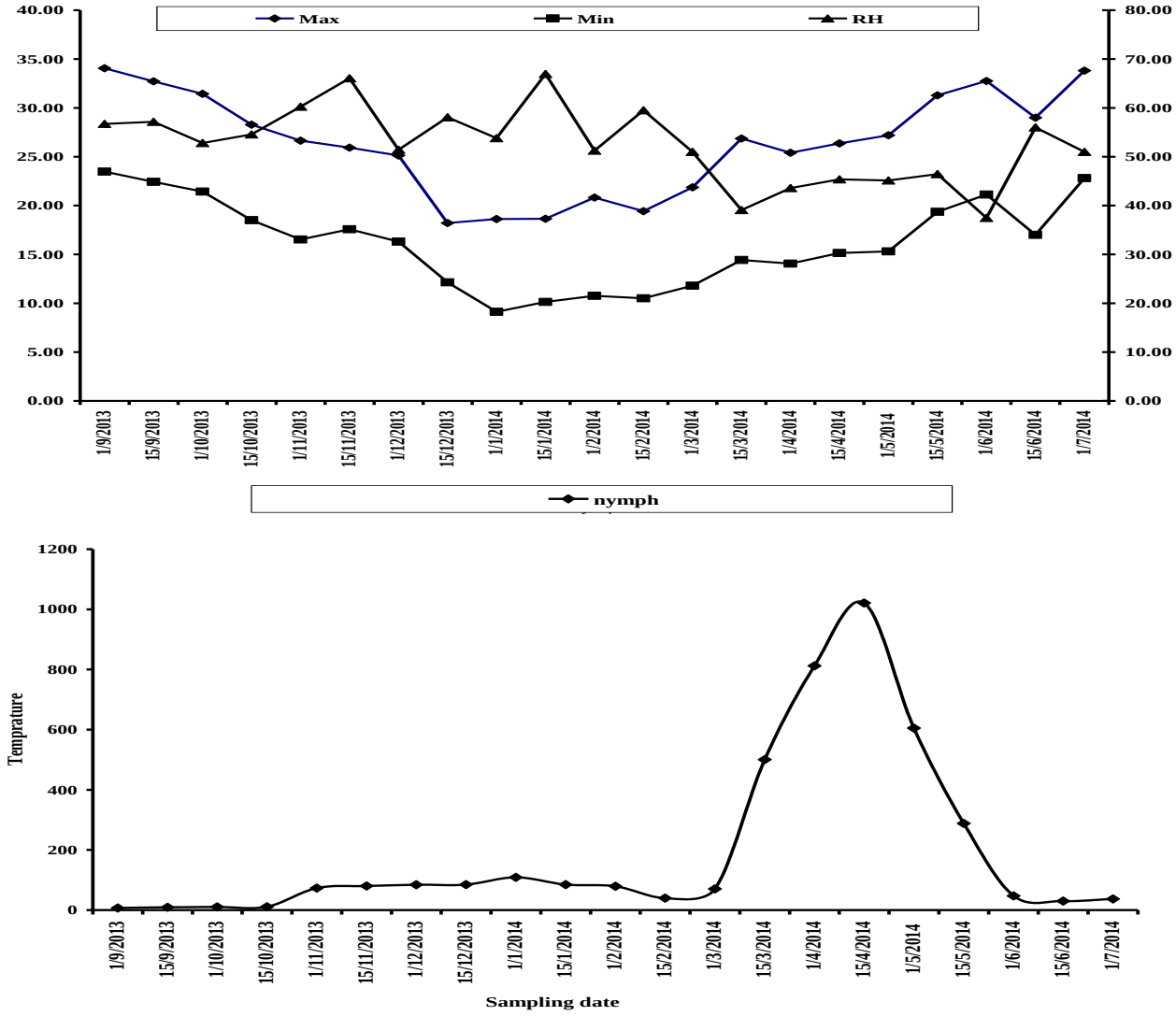

Figure (2): Population dynamics of *Aleuroclava psidii* on guava at Qaliobiya Governorate during 2013-2014 and the maximum, minimum temperatures and % RH.

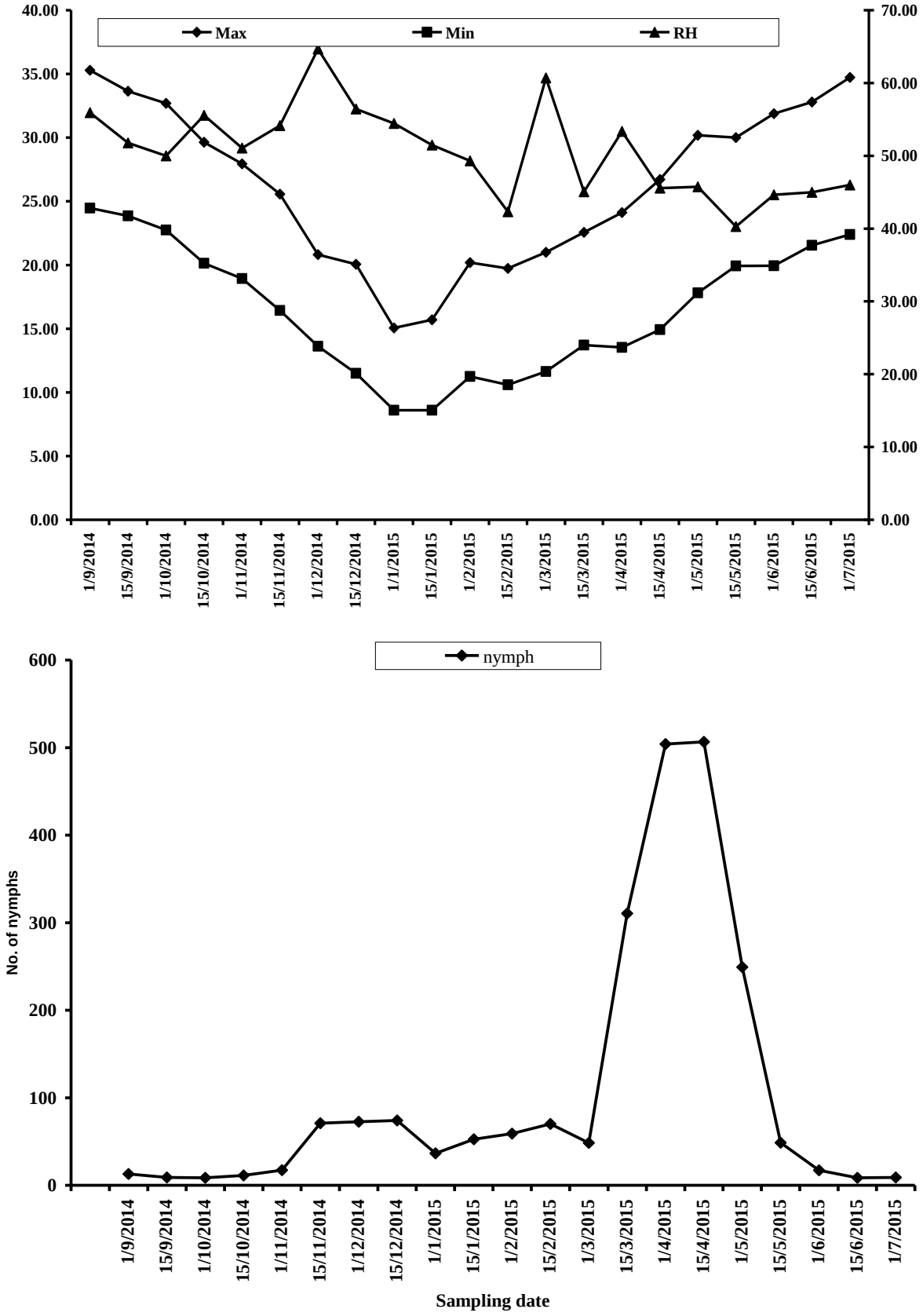

Figure (3): Population dynamics of *Aleuroclava psidii* **on guava at Qaliobiya Governorate during 2014-2015 and the maximum, minimum temperatures and % RH.**

2.2. High activity periods:

Data illustrated in Figures (6 and 7) there was a high activity period per a year of study these periods started from (first of March till first of July) its peak was 1021 and 506.6 nymphs/leaf and recorded on mid April during the two years of study, respectively. The population of nymphal stage were highly increased through these periods due to the risen of temperatures although the decrease of plant sap (fruit maturity and harvest) periods.

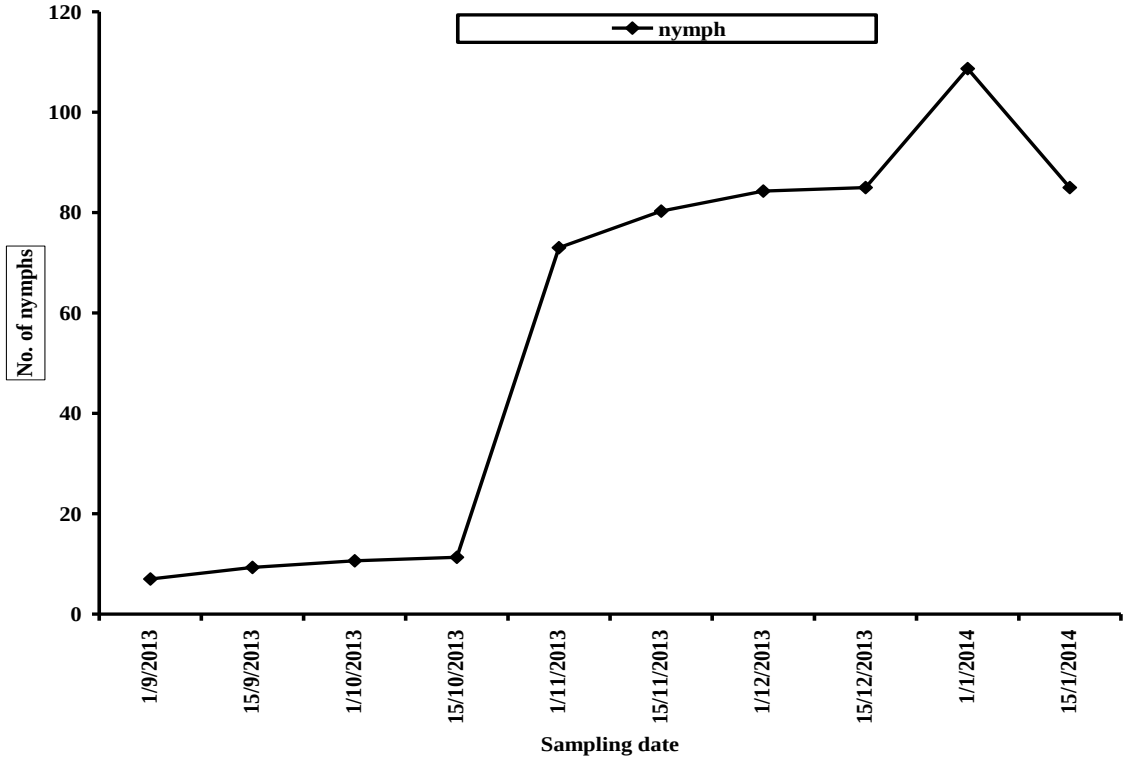

Figure (4): The relationship between *Aleuroclava psidii* nymph stage and maximum, minimum temperatures and % R.H. during the first period (2013-2014)

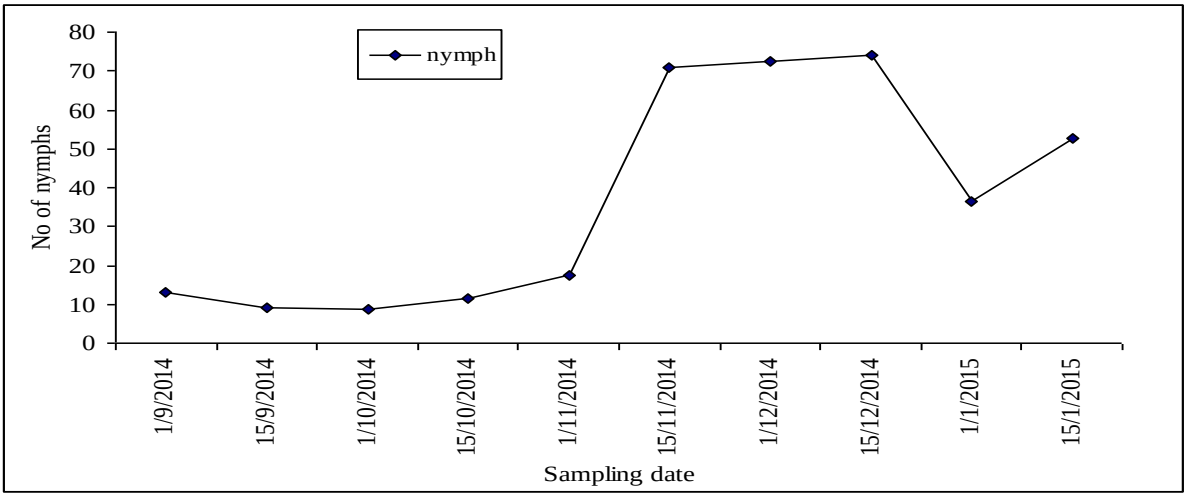

Figure (5): The relationship between *Aleuroclava psidii* nymph stage and maximum, minimum temperatures and % RH during the first period (2014-2015)

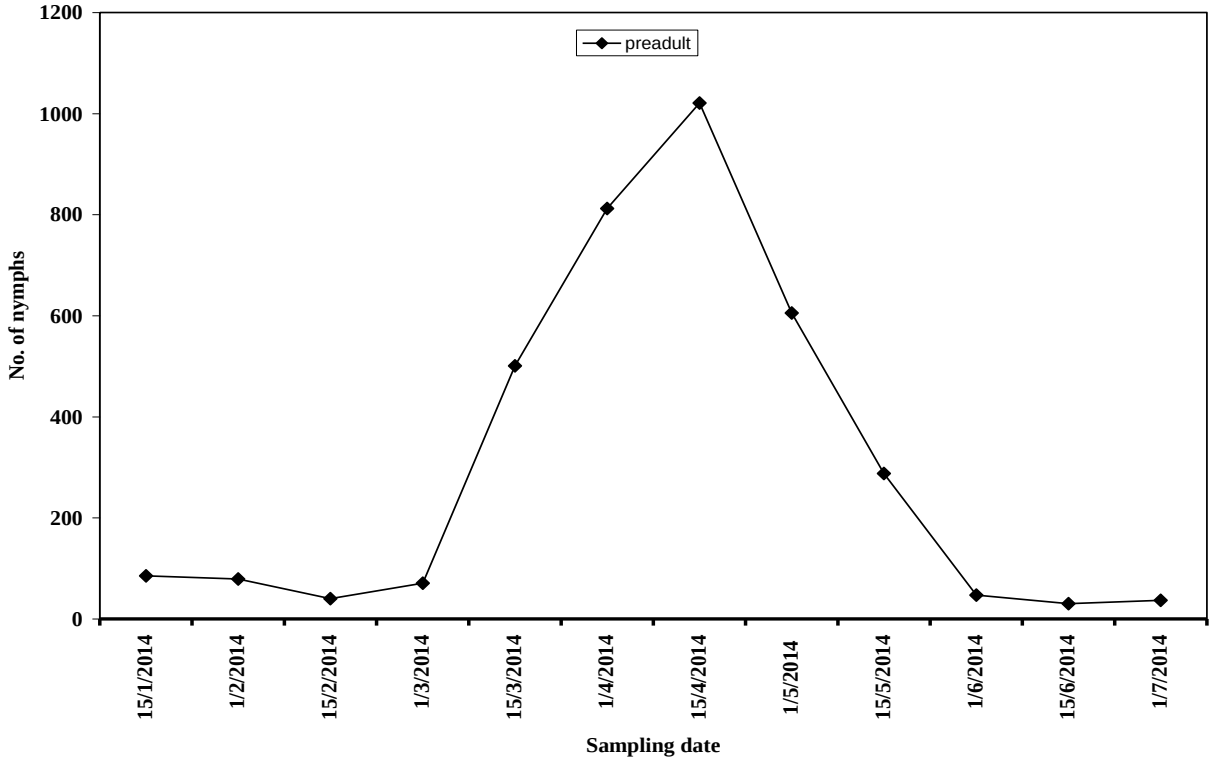

Figure (6): The relationship between *Aleuroclava psidii* nymph stage and maximum, minimum temperatures and % RH during the second period (2013-2014)

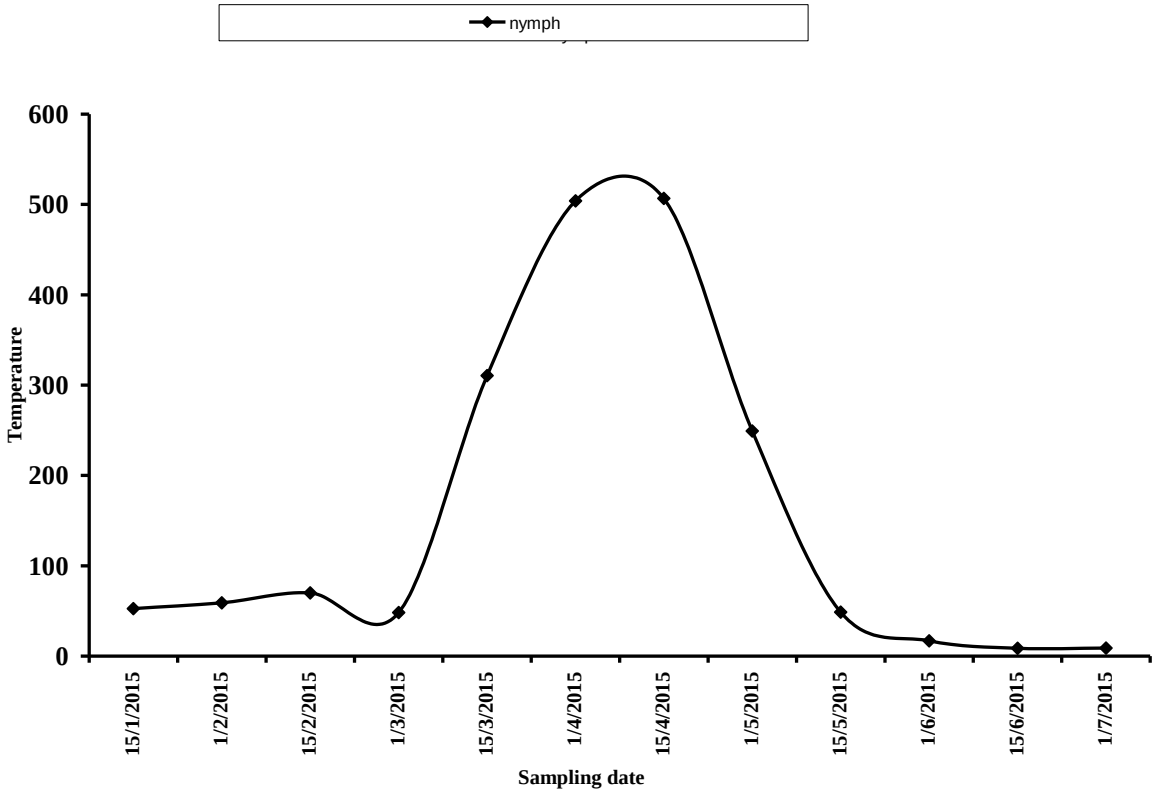

Figure (7): The relationship between *Aleuroclava psidii* nymph stage and maximum, minimum temperatures and % RH during the second period (2014-2015)

3.Effect of main climatic weather factors on nymph population density of *Aleuroclava psidii*:

The effect of abiotic factors on *A. psidii* nymphal stage was studied during two years 2013-2014/ 2014-2015 in Qaliobiya Governorate. Data tabulated in Table (1) mentioned that, each year of study was divided to two periods from 1/9 to 15/1 and from 1/2 to 1/7. During the first period of each year of study, the age plant recorded explained variance (91.35 and 76.53%) respectively. While in the second period of both years of study (E.V = 61.22 and 58.41%) respectively. All of weather factor and age plant recorded high value of the explained variance (97.12 and 91.14 %) in first period where as in the second period was (63.06 and 71. 25%) in the two years of study, respectively.

Table (1): Partial regression of three abiotic factors with their significant level and percentage of explained variance on the nymphal stage of *Aleuroclava psidii* at Qaliobiya Governorate during the two years of study.

Year	Date	Factor	Simple corr. and reg.			Partial regression		
			R	B	P	B	F	EV %
2013-2014	01/9/2013 to 15/1/2014	Max.Temp.	-0.88	-2.89	0.0008	9.90	7.29	78.47
		Min.Temp.	-0.88	-3.63	0.0008	-11.14		
		RH%	0.31	0.48	0.3979	1.53		
		Age-Age^3					21.12	91.35
		All above					16.86	97.12
	15/1/2014 to 1/7/2014	Max.Temp.	-0.03	128.32	0.9289	-5.02	1.49	38.94
		Min.Temp.	-0.13	-171.02	0.7032	-41.71		
		RH%	-0.47	-21.171	0.1400	-13.62		
		Age-Age^3					3.68	61.22
		All above					1.14	63.06
2014-2015	01/9/2014 to 15/1/2015	Max.Temp.	-0.71	16.89	0.0224	9.24	6.60	76.74
		Min.Temp.	-0.73	-23.37	0.0178	8.64		
		RH%	0.55	3.16	0.1043	2.54		
		Age-Age^3					6.52	76.53
		All above					5.14	91.14
	15/1/2015 to 1/7/2015	Max.Temp	-0.24	108.05	0.4831	70.50	1.36	36.84
		Min.Temp.	-0.33	-151.097	0.3260	-107.23		
		RH%	0.13	-4.51	0.6939	-6.35		
		Age-Age^3					3.28	58.41
		All above					1.65	71.25

These results were agreement with that obtained by Muralikrishna (1999) reported a strong positive correlation between different stages of the whitefly and weekly maximum temperature. Narayanaswamy and Ramegowda (1999) found high incidence of the pest on mulberry during April-June in and around Bangalore. The whitefly was present throughout the year in Bangalore, with high populations in summer (March-June) and low ones in winter (October-January). The population was positively correlated with temperature and negatively correlated with humidity. Krishnamoorthy (2000) recorded the population of *Aleurodicus dispersus* Russell was positively correlated with temperature and negatively correlated with humidity. Maximum. Also, Geetha (2000) stated that temperature and rainfall reduced the population of *A. dispersus,* whereas minimum temperature significantly increased the population of *A. dispersus.*

4.Survey of natural enemies of *Aleuroclava psidii*:

Data recorded in Table (2) clearly showed the presence of certain predators

and one parasitoid associated with *A. psidii* as follows:

4.1.Parasitoid:

The parasitoid *Encarsi sophia* (Giraut and Dodd) was the only recorded parasitoid with white fly *A. psidii* This result is in agreement with those obtained by Abd-Rabou and Ahmed (2012) mentioned that *Encarsi* sp. was the most abundant parasitoid associated with most different species of whiteflies. Abd Rabou and Evans (2013) who recorded that *Encarsi sophia* (Giraut and Dodd) was a virtually cosmopolitan parasitoid known to parasitized 36 species of whiteflies.

4.2. Predators:

Data present in Table (2) investigate the presence of five species of mite identified as predators were *Amblyserus swirskii* (A.-H.), Agistemus *exertus, Amblyseius enab* (Elbadry), *Euseius scutalis* (A.-H.) and *Tydeus californicus* Banks Gonzales associated with the white fly *A. psidii*. Also, there were other predators, *Chrysoperla carnea* (stephens) and *Rodalia cardinalis* (mulsant). These results are in agreement with those obtained by Abd-Rabou and Ahmed (2012) mentioned that ACARI/Phytoseiidae; *Amblyseius eharai, Amblyseius largoensis* and *Euseius stipulatus* were recorded as a predator on *Dialeurodes citri* (Ashmead) and the ACARI/ Pytoseiidae *Eusius scutalis* recorded as a predator on *Acaudaleyrodes rachipora* (Singh). Abd-Rabou (1999) said that predators play an important role in controlling whiteflies, and C*hrysoperla carnea* (stephens) considered the most abundant predator acting on *Bemisia tabaci* Biotype "B".

Table (2): List of natural enemies associated with *Aleuroclava psidii*:

Family	Scientific name
Predators	
Phytoseiidae	*Amblyseius swirskii* (A.-H.)
	Amblyseius enab (El-Badry)
	Euseius scutalis (A.-H.)
Stigaeidae	*Agistemus exsertus* Gonzales
Tydeidae	*Tydeus californicus* Banks
Parasitoids	
Aphelinidae	*Encarsia sophia* (Girault and Dodd)

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