

POPULATION DENSITY OF THE POMEGRANATE WHITEFLY, *Siphoninus phillyreae* (HALIDAY) (HOMOPTERA: ALEYRODIDAE) AND ITS PARASITIDS IN MIDDLE EGYPT.

Abdel Aleem, R.Y.*; G.A. Morsi* and M.M. Metwally**

* Fac. of Agric., Cairo Univer., Giza, Egypt

** Ministry of Agric., Agric. Res. Center, Plant Protection Res. Inst., Biological Control Dept.

ABSTRACT

The seasonal fluctuation of the population density of the pomegranate whitefly, *S. phillyreae* in Beni-Suef Governorate and its parasitism were estimated from April, 2002 to March, 2004. The infestation was from June until December, with 4- 5 annual peaks. The first year of study showed four peaks. The first peak occurred on August, 5th when the total number of all stages of the pomegranate whitefly insect per 100 leaves was 2579. The second peak in September, 20th with a peak of 5422 insects. However, the third peak, with 8054 insects / 100 leaves on the October 5th. The fourth peak with 5148 insects on November, 20th. In the second year, five peaks of 2217, 2595, 3011, 3500 and 2756 insects per 100 leaves were recorded on July 5th; August 5th, September 5th; October 5th and November 20th, respectively.

Three species of Aphelinidae: *Encarsia partenopea* Masi, *E. lutea* (Masi) and *Eretmocerus corni* Haldiman were reared from *S. phillyreae*, one species of Coccinellidae: *Clitostethus* sp. and one species of Chrysopidae viz., *Chrysoperta cameae* (Steph.) were found preying upon the eggs and nymphs of *S. phillyreae*. Evaluation of the rates of parasitism by the above-mentioned parasitoids was estimated.

INTRODUCTION

Pomegranate, *Punica granatum* L. is considered as one of the most important deciduous fruits. The pomegranate is subjected to attack of large number of insect pests, one of them is the pomegranate whitefly, *Siphoninus phillyreae* (Haliday) (Homoptera: Aleyrodidae)

The pomegranate white fly mainly attacks pomegranate trees and causes considerable damage to them. Besides pomegranate, *S. phillyreae* also attack apple, *Malus sylvestris* Mall.; pear, *Pyrus communis* L.; and quince, *Pyrus cydonia* L. trees (Priesner and Hosny, 1932).

S. phillyreae is among the most destructive pests attacking pomegranate in many countries (Elwan, 1982; Sorensen *et al.*, 1990 and Leddy *et al.*, 1993). Many authors studied the natural enemies of *S. phillyreae*, (Priesner and Hosny, 1940; Mazzone, 1983; Bellows *et al.*; 1992) Many and Krishnamoorthy, 1995 and Abd-Rabou, 1997). Differences in the population densities of this insect were recorded in few parts of the world (Priesner and Hosny, 1932; Elwan, 1982; and Gould *et al.*; 1992).

Various aphelinid parasitoids (Hymenoptera: Aphelinidae) have been reported from *S. phillyreae*, including, *Encarsia inaron* (Walker), *E. siphonini* Silvestri, *E. galilea* Rivney, *E. hespida* DeSantis, *E. psedopartenopea* Viggiani, *E. davidi* Viggiani, *E. lutea* (Masi), *Eretmocerus corni* Haldiman, *Er. diversicilatus* and *Er. mundus* Mercit (Priesner and Hosny, 1940; Mentzeloz,

1967; Viggiani and Mazzone, 1980 a& b; Viggiani and Battaglia, 1983; Rivney and Girling, 1987; Polaszek et al., 1992 and Abd-Rabou and Abou-Setta, 1998)

The scope of the study included the following aspects:

- 1-Survey of the natural enemies, parasitoids and predators of the pomegranate white fly, *S. phillyreae*.
- 2-The seasonal variations in the population dynamics of the pomegranate white fly, *S. phillyreae* in Beni-Suef Governorate.
- 3-Evaluation of the rate of parasitism caused by the parasitoids.

MATERIALS AND METHODS

I: Survey of natural enemies:

A survey of the pomegranate white fly, *S. phillyreae* parasitoids and predators was carried out in Beni-Suef Governorate throughout a period of two years, extending from May, 2002 till April, 2004.

Samples of infested leaves with this pest were randomly collected from different orchards in different months of the year. These specimens were carefully examined and a needle was used to remove all the insects except only the pomegranate whitefly insect, *S. phillyreae* to survey its natural enemies. The examined leaves were enclosed in plastic jars of 15 cm. diameter and 20 cm. height covered with muslin held in its position by a rubber band and kept under preferential conditions for securing any emergence of parasitoids or associated predators. The parasites were collected, sorted into species and preserved in vials containing 70% Etyhanol and Glycerin, plus slide mounting specimens. The parasites and predators species were identified in Biological Control Res., Dept., Plant Prot. Res. Inst., Ministry of Agric.

II: Seasonal fluctuation of the population density of the pomegranate whitefly, *S. phillyreae* in Beni-Suef Governorate:

The selected orchard about half feddan in area and 10 years old, was cultivated with the pomegranate, *P. granatum* and heavily infested with the pomegranate whitefly. The orchard was not exposed to any chemical measures during the period of investigation. Half-monthly sample of 100 leaves was taken at random from the different directions of orchard. The leaves represented the different sides, the peripheral, inner zones, the lower and middle strata of the tree. These leaves were kept in paper bags and transferred to the laboratory. The samples were examined by using stereoscopic microscope. Stages of the pomegranate whitefly insect considered in counting process were :eggs, nymphal instars and pupae.

III- Rate of parasitism upon *S. phillyreae*:

Heavily infested leaves from the pomegranate trees were selected at random from cardinal directions and central cores of the trees. Half-monthly sample (100 randomly selected nymphs and pupae 50 of each) was chosen. This sample represented the second and third nymphal instars and pupae. This sample was divided into 4 replicates with 25 nymphs or pupae, each

nymph or pupa was removed, transferred and mulched on a slide in a water film and classified as follows: alive unparasitized, parasitized insects having (parasitic larvae, pupal parasitoids and emergence holes). The total percentage of parasitism of the pomegranate whitefly insect was estimated.

IV: The abundance of the parasitoids attacking the pomegranate whitefly insect, *S. phillyreae*:

Total number of the pomegranate whitefly insect individuals (nymphal instars and pupae) were recorded per leaf. Each leaf was stored in well-ventilated glass emergence tube for parasitoids emergence that their numbers were recorded daily and their percentages were calculated.

RESULTS AND DISCUSSION

I: Survey of the natural enemies:

The obtained results showed that, the natural enemies of *S. phillyreae* are:

a-Parasitoids: Three Aphelinid species: *Encarsia partenopea* Masi, *E. lutea* (Masi) and *Eretmocerus corni* Haldiman were related with *S. phillyreae*

b-Predators: One species of Coccinellidae: *Clitostethus* sp. and one species of Chrysopidae viz., *Chrysoperla carnea* (Steph.), the larvae and adults of the first species and the larvae of the second species were found feeding on the eggs and nymphs of this insect.

Encarsia lutea was recorded for the first time in Egypt by Abdel-Fattah *et al.*, (1984). It is distributed at El-Arish, Aswan, Assiut, Qalyubiya, Cairo, Dakhla, Oasis, El-Fayoum, Giza and Siwa Oasis. It was found associated with *A. niloticus* on *Zizyphus spina chritis*; *Aleuroplatus acaciae* on *A. tortilis*; *B. tabaci* on *L.camara*; *P. myrica* on *Citrus* sp. and *S. phillyreae* on *P. granatum*.

II: Seasonal fluctuation of the population density of the pomegranate whitefly, *S. phillyreae* :

Data obtained (Table,1) revealed that the population changes of the pomegranate white fly insect, *S. phillyreae* in the first year of study showed four peaks. The first peak occurred on August, 5th when the total number of all stages of the pomegranate whitefly insect per 100 leaves was 2579. The numbers then dropped down sharply to reach a bottom towards the beginning of September, after which the population insect increased suddenly again and reached the second peak in September, 20th with a peak of 5422 insects. After another drop in the beginning of October the population density reached the third peak, with 8054 insects / 100 leaves on the October 20th. The numbers decreased in the beginning of November, then it increased sharply during the end of November to reach the fourth peak with 5148 insects (Eggs, nymphs and pupae) on November, 20th.

Table (1): Population of the pomegranate whitefly *S. phillyreae* per 100 leaves in Beni-Suif Governorate during (2002/2003).

Sampling date	Eggs	1 st Nymphs	2 nd & 3 rd Nymphs	Pupae	Total
20/5	7	0	0	0	7
5/6	29	6	3	2	40
20/6	65	18	68	23	174
5/7	164	89	196	62	411
20/7	205	62	195	73	535
5/8	1312	245	781	241	2579
20/8	982	139	329	228	1678
5/9	374	86	253	134	874
20/9	2987	611	1678	146	5422
5/10	3124	411	1139	311	4985
20/10	3210	874	1412	573	8054
5/11	1187	213	627	298	2325
20/11	2863	396	1342	574	5148
5/12	527	89	238	163	1017
20/12	145	43	137	62	387

In the second year of investigation 2003/2004, five peaks of 2217, 2595, 3011, 3500 and 2756 insects (all stages) per 100 leaves were recorded on July, 5th; August 5th, September, 5th, October 5th and November 20th, respectively (Table, 2). In this respect, Elwan (1982) in Egypt recorded four to five generations for this insect per year.

Table (2): Population of the pomegranate whitefly *S. phillyreae* per 100 leaves in Beni-Suif Governorate during (2003/2004).

Sampling date	Eggs	1 st Nymphs	2 nd & 3 rd Nymphs	Pupae	Total
20/5	11	3	2	0	16
5/6	79	48	85	13	225
20/6	315	142	214	56	727
5/7	1412	316	411	78	2217
20/7	812	124	198	68	1170
5/8	1175	522	613	285	2595
20/8	687	514	786	362	2349
5/9	1295	912	457	347	3011
20/9	986	504	712	412	2614
5/10	1435	825	913	327	3500
20/10	745	413	564	274	1996
5/11	654	327	458	137	1576
20/11	665	311	645	159	2756
5/12	312	114	197	118	741
20/12	48	18	33	14	113

Data of the two years of investigation showed that the infestation began low during May, June and July, while severe infestation occurred during August, September, October, and November. However, it could be mentioned that the optimum zone for the activity of *S. phillyreae* whitefly occurred in 33.5-35.7°C with an average of 34.2°C for daily maximum temperatures, 20.0-21.4°C with an average 20.9°C for daily minimum night temperature and 63.6-65.7% with an average of 63.9% for the day mean relative humidity during the successive months (August, September, October, and November) of the years 2002, 2003 and 2004. In winter the pomegranate whitefly was not present on the pomegranate trees, this due to the physiological status of the trees whose leaves were fallen in winter months. In the end of spring it increased slightly in May and reaching its maximum density during August till November. The population began to decrease during December and disappeared completely in January till next May.

In this respect, Elwan (1982) in Egypt recorded four to five annual generations for this insect. The relative size of the different generations were relatively similar. All stages were mainly concentrated on the lower third of the tree. The maximum abundance of all stages of *S. phillyreae* took place between mid August and mid November.

III- Rate of parasitism upon *S. phillyreae*:

Concerning the role of parasitoids in suppressing the pomegranate whitefly insect, *S. phillyreae* populations, on the pomegranate, data in Table (3) indicate that, *S. phillyreae* parasitoids were present from June to December during the two years of investigation. In the first year, the total percentage of parasitism of *S. phillyreae* individuals (nymphs and pupae) increased gradually through June and reach to the first peak of 27 % on August, 20th. It then dropped down sharply to reach a low level of 19 % on September 5th, after which it increased suddenly to reach the second peak of 43 % on October 5th. It dropped down again to reach a bottom of 29.0 % on October, 20th and then increased suddenly to reach the third peak of 41 % during November 5th. After that, it decreased gradually to reach a bottom of 37 % at November 20th, and then started to increase and reach to the fourth peak of 48 % on December, 5th.

Throughout the second year of investigation, the same trend with minor differences was found, the five peaks, 39, 51, 49, 42 and 46 % occurred on July 5th, August 20th, October 5th, September 5th and December 5th (Table 3).

Concerning the role of *S. phillyreae* parasitoids, Abd-Rabou (1998) reported that, total parasitism reached a maximum of 80 % during August 1994, with *E. inaron* being responsible for 66.1 % at Giza region. Abd-Rabou and Abou-Setta (1998) recorded 7 parasitoid species associated with *S. phillyreae*. They mentioned that the parasitoid *E. inaron* was dominant parasitoid of *S. phillyreae* in Giza and Assiut with average parasitism rates of 38 and 36.5, respectively.

Table (3): Total percentages of parasitism among the pomegranate whitefly *S. phillyreae* infesting the pomegranate during the 2002/ 2003 & 2003/2004 seasons (Based on 100 dissected scale insects).

Sampling date	2002/ 2003 season					Sampling date	2003/ 2004 season				
	Larvae	Pupae	Hole Emergence	Total	% Parasitism		Larvae	Pupae	Hole Emergence	Total	% Parasitism
5/6	1	1	0	2	2	5/6	2	1	0	3	3
20/6	4	2	1	6	6	20/6	5	2	2	9	9
5/7	3	5	2	10	10	5/7	16	11	12	38	39
20/7	3	2	2	7	7	20/7	7	3	3	13	13
5/8	4	2	4	11	11	5/8	8	7	5	20	20
20/8	11	9	7	27	27	20/8	23	11	16	51	51
5/9	9	6	4	19	19	5/9	6	2	11	19	19
20/9	8	7	6	21	21	20/9	7	13	6	25	25
5/10	19	12	12	43	43	5/10	21	13	15	49	49
20/10	11	7	11	29	29	20/10	12	6	10	28	28
5/11	23	9	9	41	41	5/11	15	17	10	42	42
20/11	18	11	8	37	37	20/11	3	4	10	18	18
5/12	22	11	15	48	48	5/12	22	13	7	46	46
20/12	3	5	6	14	14	20/12	3	2	7	12	12

IV: Abundance of the parasitoids attacking the pomegranate whitefly insect, *S. phillyreae*:

S. phillyreae was parasitized by *E. partenopea*, *E. lutea* and *Er. corni* at average rates of 14.5, 1.7 and 5.7 %, respectively, (Table, 4). There were four peaks of 51.6, 59.5, 51.1 and 46.2 % parasitism on July 5th, August 5th, September 5th and November 5th, respectively. Priesner and Hosny (1932) recorded *E. inaron* as a parasitoid of *S. phillyreae* on *P. granatum* and indicated a rate of parasitism as high as 80 %.

Lowest percentage of parasitism was 3.6% in December 20th, while the highest percentage of parasitism was 59.5% in august 5th. The allover mean of percentages of parasitism was 22.0%.

Table (4): Percent parasitism of the pomegranate whitefly *S. phillyreae* by different parasitoids during 2002/2003 in Beni-Suif Governorate.

Sampling date	Whitefly individuals / leaf	Parasitism percent			
		<i>E.partenopea</i>	<i>E. lutea</i>	<i>Er. corni</i>	Total
20/5	2.6	0	0	0	0
5/6	16.3	8.6	0.7	2.1	11.4
20/6	19.8	21.2	3.1	11.2	25.4
5/7	23.4	28.8	5.3	12.5	51.6
20/7	26.5	21.5	3.6	17.8	42.9
5/8	34.7	43.2	2.1	14.1	59.5
20/8	46.5	34.2	1.2	10.7	46.1
5/9	30.5	32.5	3.4	15.6	51.1
20/9	56.4	29.8	1.7	17.5	49.0
5/10	62.4	33.2	2.3	9.4	44.9
20/10	32.5	31.9	3.5	8.6	44.0
5/11	66.3	29.8	6.2	10.2	46.2
20/11	43.2	18.6	2.4	9.7	30.7
5/12	29.6	11.2	6.0	3.7	20.9
20/12	11.3	3.6	0	0	3.6
Total	502	347.8	41.5	143.1	527.3
Mean	20.9	14.5	1.7	5.7	22.0

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الكثافة العددية لذبابة الرمان البيضاء سايفنيوس فيليرى (هاليدى)
(متشابهة الأجنحة - البروديدى) وطفيلياتها فى مصر الوسطى
ربيع يحيى عبد العليم* - جمال عبد الناصر مرسى** و ممدوح محمد متولى**
* كلية الزراعة - جامعة القاهرة - الجيزة - مصر
** مركز البحوث الزراعية - قسم مكافحة الحيوية

اجريت دراسة حقلية على ذبابة الرمان البيضاء فى احد بساتين الرمان فى محافظة بنى سويف وذلك لدراسة التذبذبات الموسمية فى اعداد الحشرة. وتم تقدير التعداد فى الفترة من ابريل ٢٠٠٢ الى مارس ٢٠٠٤ حيث وجدت الاصابة فى الفترة من يونيو حتى ديسمبر مع أربعة إلى خمسة قمم للتعداد، ظهرت القمة الاولى فى الخامس من اغسطس عندما بلغت اعداد الاطوار المختلفة للحشرة ٢٥٧٩ فرد / مائة ورقة. فى حين ظهرت القمة الثانية فى العشرين من سبتمبر بتعداد بلغ ٥٤٢٢ فرد/مائة ورقة. كذلك فان القمة الثالثة بلغت ذروتها ٨٠٥٤ فرد/مائة ورقة فى العشرين من أكتوبر والقمة الرابعة فى العشرين من نوفمبر بتعداد بلغ ٥١٤٨ فرد/مائة ورقة وذلك للعام الاول من الدراسة ٢٠٠٢ / ٢٠٠٣. وفى العام الثانى للدراسة ٢٠٠٣ / ٢٠٠٤ ظهرت خمسة قمم للتعداد هى ٢٢١٧ ، ٢٥٩٥ ، ٣٠١١ ، ٣٥٠٠ و ٢٧٥٦ فرد/مائة ورقة تم تسجيلها فى أشهر يوليو، أغسطس، سبتمبر، أكتوبر و نوفمبر على التوالي كما تم تسجيل ثلاث طفيليات حشرية تابعة لعائلة أفليندى هى إنكارسيا بارتينوبيا ماسى، انكارسيا ليوتيا (ماسى) وارتيوسويس كورنى هاليدمان والتي وجدت مرتبطة بحشرة ذبابة الرمان البيضاء، كما تم تسجيل نوع من كوكسينليدى هو كيلتوستاسيس اسبيش ونوع من كراى سويدي هو أسد المن كراسوبيرلا كارني والتي وجدت يرقاته تفترس بيض وحوريات ذبابة الرمان البيضاء. وقد تم تقدير نسبة التطفل للطفيليات المذكورة سابقا.