

Insect Pests Attacking Pomegranate Trees and Associated Predators at Kafr El-Sheikh Region, Egypt

Mesbah, A. H.

Department of Biological Control, Plant Protection Research Institute, Dokki, Giza, Egypt
(Received: November 12 and Accepted: November 27, 2008)

ABSTRACT

The present study was conducted to record the insect pests attacking pomegranate trees and associated insect predators as well all the population dynamics of the dominant pest and its related predators at Kafr El-Sheikh region for two growing seasons, 2005 and 2006. Thirteen insect pests were recorded attacking pomegranate trees. The whitefly, *Siphoninus phillyreae* was the most dominant one, followed by *Empoasca lybica*, *Aphis punica* and *Icerya aegyptiaca*. Twenty insect predators were recorded associated with previous pests. The major predators belong to order Coleoptera, family; Coccinellidae. *Scymnus interruptus* was the most occurring predator in the two seasons. *Clitostethus arcuatus*, *Cydonia vicina isis* and the anthocorids, *Orius* spp. were considerable predators on pomegranate trees. The predator, *C. arcuatus* was highly correlated with the dominant whitefly *S. phillyreae*. The population dynamics of *C. arcuatus* and *S. phillyreae* indicated that the pest and related predator appeared together by the first week of August, while the highest infestation was recorded from mid-September and extended to the first week of November.

Key Words: Pomegranate pests, predators, pomegranate whitefly *Siphoninus phillyreae*, *Clitostethus arcuatus*.

INTRODUCTION

Pomegranate (*Punica granatum* L.) is a native tree from Iran to the Himalaya in northern India and at whole Mediterranean region since ancient times. It is widely cultivated throughout India and the drier parts of southeast Asia, Malaysia, the east Indies, and tropical Africa. The tree was introduced into California by Spanish settlers in 1769. The most important growing regions are; Egypt, China, Afghanistan, Pakistan, Bangladesh, Iran, Iraq, India, Burma and Saudi Arabia (LarRue 1980 and Kahlon, 2002). The pomegranate orchard, extend from north coast to southern Egypt, and it is the most important cultivar in Upper Egypt (Abd Rabou, 1998).

Available literature in Egypt about the pomegranate insect fauna are very few. The most abundant recorded pest is the pomegranate whitefly *Siphoninus phillyreae* (Abd Rabou, 1998, Mesbah, 2000 and 2003 and Abd Rabou, 2006).

Therefore, this work aimed to shed light on the important pests attacking pomegranate trees and associated predators.

MATERIALS AND METHODES

The study was carried on pomegranate trees growing at the experimental farm, Faculty of Agriculture, Kafr El-Sheikh University, in 2005 and 2006 seasons.

To survey the insect pests attacking pomegranate trees and associated predators as well as their

population dynamics, one hundred pomegranate leaves were picked randomly representing the four cardinal directions (north, south, east and west) where 25 leaves were taken from each direction. One hundred double strokes of sweep net were taken also from the four cardinal directions; 25 ones from each direction. The samples from leaves or sweep net catch of each direction were placed separately in plastic bag and transferred to the laboratory for examination under stereobinocular microscope. Insect pests and associated predators were counted and classified in the Classification Department, Plant Protection Research Institute, Dokki, Giza, Egypt. Coefficient of correlation between important insect pests and their predators were calculated.

RESULTS AND DISCUSSION

Insect pests:

Thirteen insect pests were recorded attacking pomegranate trees during 2005 and 2006 seasons (Table 1). The pomegranate whitefly was the most abundant one and represented the highest number especially in the south and east directions during the two study seasons (1191 and 1140 immatures/450 leaves, respectively), while the lowest number was recorded in the west direction in 2006 season (454 immatures/450 leaves). *Empoasca lybica* occurred with high numbers especially during 2005 season in the east and north directions, 545 and 361 individuals/450 leaves, respectively. *Aphis punica* was recorded with highest number during 2005 on the east and west directions (372 and 231 individuals/450 leaves, respectively), while the highest number was recorded on south direction and

represented with 280 indiv./450 leaves during 2006 season. For the Egyptian mealy bug, *Icerya aegyptica*, it occurred with high number, 26, 27, 24 and 17 insects/450 leaves, respectively, in the south and east directions during 2005 and 2006 seasons.

Predators:

Twenty insect predators were recorded associated with insect pests on pomegranate trees during 2005 and 2006 seasons (Table 1). The most abundant predatory species belonged to family Coccinellidae. *Scymnus interruptus* occurred with the highest numbers (194, 136, 179 and 100 predators/450 double strokes) during the two seasons especially on the south and east direction respectively.

Clitostethus arcuatus was recorded with high number (52 predators/450 strokes), in the east direction during 2006 season while the lowest number (13 ind./450 strokes) occurred in the north direction during 2005 season. The anthocorid predators *Orius* spp. differed from one season to another as well as on the directions. *Orius* spp. occurred with high number (33 and 32 predators/450 strokes) during 2005 season in the south and east directions respectively, while the lowest number 11 predators/450 strokes was recorded in the west direction during 2006 season. The true spiders were considered in this survey, where their numbers were 82, 93, 82, 82 & 81, 82, 80 and 99 spiders at the different directions (north, south, east and west) in 2005 and 2006, respectively (Table 1).

Statistical analysis (Table 2) showed highly significant correlations between the predator, *C. arcuatus* and *S. phillyreae* eggs in the north and east directions in the two seasons and the west in 2006 season, while it was only significant in the south direction in the two seasons. Data also indicated highly significant correlations between the former predator and *S. phillyreae* larvae in the north, south and east directions and with pupae in the north and south directions in the two seasons and only in the west direction during 2006 season (Table 2). The relationship between the predator, *R. cardinalis* and both *P. citri* and *I. aegyptica* differed during the two seasons as well as at the four directions, where it was negative on the north direction, but highly significant in the east direction in 2005 season and only positive in the other directions. The same trend as for *Scymnus* spp. and both *S. phillyreae* immatures, *P. citri* and *I. aegyptica* during the two study seasons (Table 2).

Data in Table (1) revealed that *S. phillyreae* was the most dominated pest on pomegranate trees followed by *E. lybica*, mealy bugs and aphids. On

the other hand, the predators, *S. interruptus*, *Symnus* spp. and *C. arcuatus* were the most abundant predators with the previous pests. The present data are in agreement with those of Priesner and Hosney (1932) and Abd-Rabou (1998 and 2006) who recorded that the pomegranate whitefly, *S. phillyreae* is the most important pest species of pomegranate orchards in Egypt.

S. interruptus is usually found in connection with aphid infestation and mealy bugs (Priesner and Hosny, 1940). They also found that *S. includens* feeds on *Pseudococcus citri* while *Rodalia cardinalis* preys on *Icerya aegyptica*.

Population dynamics of *Siphonius phillyreae* immatures and the predator *Clitostethus arcuatus*:

S. phillyreae was the most dominant pest on pomegranate orchard (Table 1). At the same time, the coccinellid predator, *C. arcuatus* had highly correlated with *S. phillyreae* immatures during 2005 and 2006 (Table 2). Loi (1978), Bathon and Pietrzk (1986) and Gerling (1990) recorded that *C. arcuatus* was the considerable predator of aleyrodids. In Egypt, this predator was recorded for the first time as a predator of the citrus whitefly *Dialeurodes citri* by Mesbah *et al.* (1998).

Regarding the population dynamics of the predator, *C. arcuatus* and *S. phillyreae* immatures, data illustrated in Fig. (1) showed that the pomegranate trees were free from *S. phillyreae* and *C. arcuatus* from April 8 until the first week of August in both seasons, 2005 and 2006 (Figs. 1 & 2). The pest immatures and the predator appeared together in the second week of August in different directions during the two seasons. The highest peak of *S. phillyreae* eggs in north direction was detected on September 19 (2005) which coincided with the first peak of the predator. The second peak of *S. phillyreae* eggs was recorded in November 2, while the second peak of the predator was recorded by the second week of December in the same direction (Fig. 1). The south and east directions received the highest number of *S. phillyreae* eggs. The highest peak of *S. phillyreae* eggs was detected on September 19 in the south direction, while in the east direction, the highest peak of the eggs was recorded on November 2 which coincided with the highest peak of the predator, *C. arcuatus* (Fig. 1). The same trend was observed during the second season 2006 (Fig. 2). Generally, the pest and the predator appeared together by the first week of August. The highest peak of *S. phillyreae* eggs was recorded on September 19 as well as the highest peak of the predator in the north direction. The

Table (1): Insect pests and associated predatory species in the cardinal directions of pomegranate trees at Kafr El-Sheikh region during 2004 and 2005 seasons.

No.	Insect species	Stage	Insect species/450 leaves and or 450 double strokes							
			Cardinal directions							
			North		South		East		West	
		2004	2005	2004	2005	2004	2005	2004	2005	
1. Pests:										
1	<i>Ceratitis capitata</i> Wied	A	2	15	7	13	13	25	9	34
2	<i>Nezara viridula</i> L.	A,N	18	34	9	37	21	30	17	23
3	<i>Empoasca lybica</i> deBarg	A,N	361	198	323	301	545	220	230	180
4	<i>Oxycarenus hyalinipennis</i> Costa	A,N	2	2	0	2	7	3	6	0
5	<i>Alleurotrachelus citri</i> P & H	Imm.	13	13	7	24	11	20	17	22
6	<i>Siphoninus phillyreae</i> (Haliday)	Imm.	525	746	1191	1140	844	818	740	454
7	<i>Aphis punica</i> (Theobald)	A,N	146	26	170	280	372	24	231	22
8	<i>Coccus acuminatus</i> (Signoret)	A	2	1	0	0	5	6	3	0
9	<i>Parasaitetia nigra</i> (Nietmer)	A	1	1	2	1	6	0	0	0
10	<i>Aonidiella aurantii</i> Mask.	A	3	3	3	3	2	1	3	2
11	<i>Chrysomphalus ficus</i> Ashm.	A	2	2	1	1	1	1	1	2
12	<i>Icerya aegyptiaca</i> (Douglas)	A,N	11	11	26	27	24	17	16	12
13	<i>Pseudococcus citri</i> Risso	A	9	7	0	1	3	2	5	2
2. Predators:										
1	<i>Clitostethus arcuatus</i> (Rossi)	A	13	20	19	19	26	52	20	25
2	<i>Cydonia vicina isis</i> Cro	A	13	7	14	5	19	11	14	9
3	<i>C. vicina nilotica</i> (Muls.)	A	4	3	2	2	6	1	2	3
4	<i>C. vicina sub signata</i> Pic.	A	1	0	0	0	2	1	2	3
5	<i>Hypodimidia trideampunctata</i>	A	0	0	0	0	0	0	1	0
6	<i>Rhizobius littura</i> Fab.	A	2	0	2	0	2	1	3	2
7	<i>Rodalia cardinalis</i> Muls.	A	4	5	6	4	5	3	1	2
8	<i>Scymnus bipunctata</i> Frol.	A	1	1	0	0	0	2	0	0
9	<i>S. gilvifrons</i> Muls.	A	4	3	6	5	3	2	4	2
10	<i>S. includens</i> Kirsch	A	2	6	4	2	7	2	6	4
11	<i>S. interruptus</i> Goiz	A	131	79	194	136	179	100	121	70
12	<i>S. syriacus</i> Mars.	A	2	0	3	1	3	1	3	2
13	<i>Scymnus</i> spp.	A	7	7	19	6	12	13	14	9
14	<i>Carpophilus mutilatus</i> Erichson	A	0	1	0	1	0	1	0	0
15	<i>Oxytelus nitidulus</i> Grav.	A	5	2	2	2	2	3	6	1
16	<i>Paederus alferii</i> Koch	A	10	11	13	10	12	7	16	7
17	<i>Syrphus</i> spp.	L	4	3	3	2	3	1	5	3
18	<i>Orius</i> spp.	A,N	28	16	33	15	25	19	32	11
19	<i>Calidomantis savignii</i> (Sovss)	A,N	2	2	2	5	4	6	2	11
20	<i>Chrysoperla carnea</i> (Steph.)	L	1	0	1	0	4	0	4	3
21	True spiders		82	81	93	82	82	80	82	99

Table (2): Correlation coefficient (r) values among the common pests and associated predators in the cardinal directions of the pomegranate trees during 2005 and 2006 seasons.

Variables	North		South		East		West	
	2004	2005	2004	2005	2004	2005	2004	2005
<i>C. arcuatus</i> x <i>S. phillyreae</i> eggs	0.871**	0.858**	0.592*	0.567*	0.651**	0.670**	0.181	0.671**
<i>C. arcuatus</i> x <i>S. phillyreae</i> larvae	0.684**	0.634**	0.885**	0.892**	0.617**	0.629**	0.050	0.463
<i>C. arcuatus</i> x <i>S. phillyreae</i> pupae	0.731**	0.797**	0.910**	0.882**	0.221	0.278	0.075	0.785**
<i>R. cardinalis</i> x <i>Pseudococcus citri</i>	-0.026	0.118	0.207	0.101	0.748**	0.404	0.240	0.125
<i>R. cardinalis</i> x <i>Icerya aegyptiaca</i>	-0.157	-0.173	-0.065	0.463	0.651**	0.342	0.245	0.134
<i>Scymnus</i> spp. x <i>S. phillyreae</i> eggs	0.216	0.211	0.591**	0.364	0.301	0.172	0.636**	0.342
<i>Scymnus</i> spp. x <i>S. phillyreae</i> larvae	-0.057	0.260	0.521**	0.518*	0.499*	0.132	0.566**	0.015
<i>Scymnus</i> spp. x <i>S. phillyreae</i> pupae	-0.460	0.226	0.541*	0.403	0.426	0.136	0.559*	0.211
<i>Scymnus</i> spp. x <i>Pseudococcus citri</i>	-0.157	0.093	0.541*	0.042	0.066	0.011	0.019	0.295
<i>Scymnus</i> spp. x <i>Icerya aegyptiaca</i>	0.010	0.276	0.487*	0.222	0.555*	-0.128	0.025	0.158

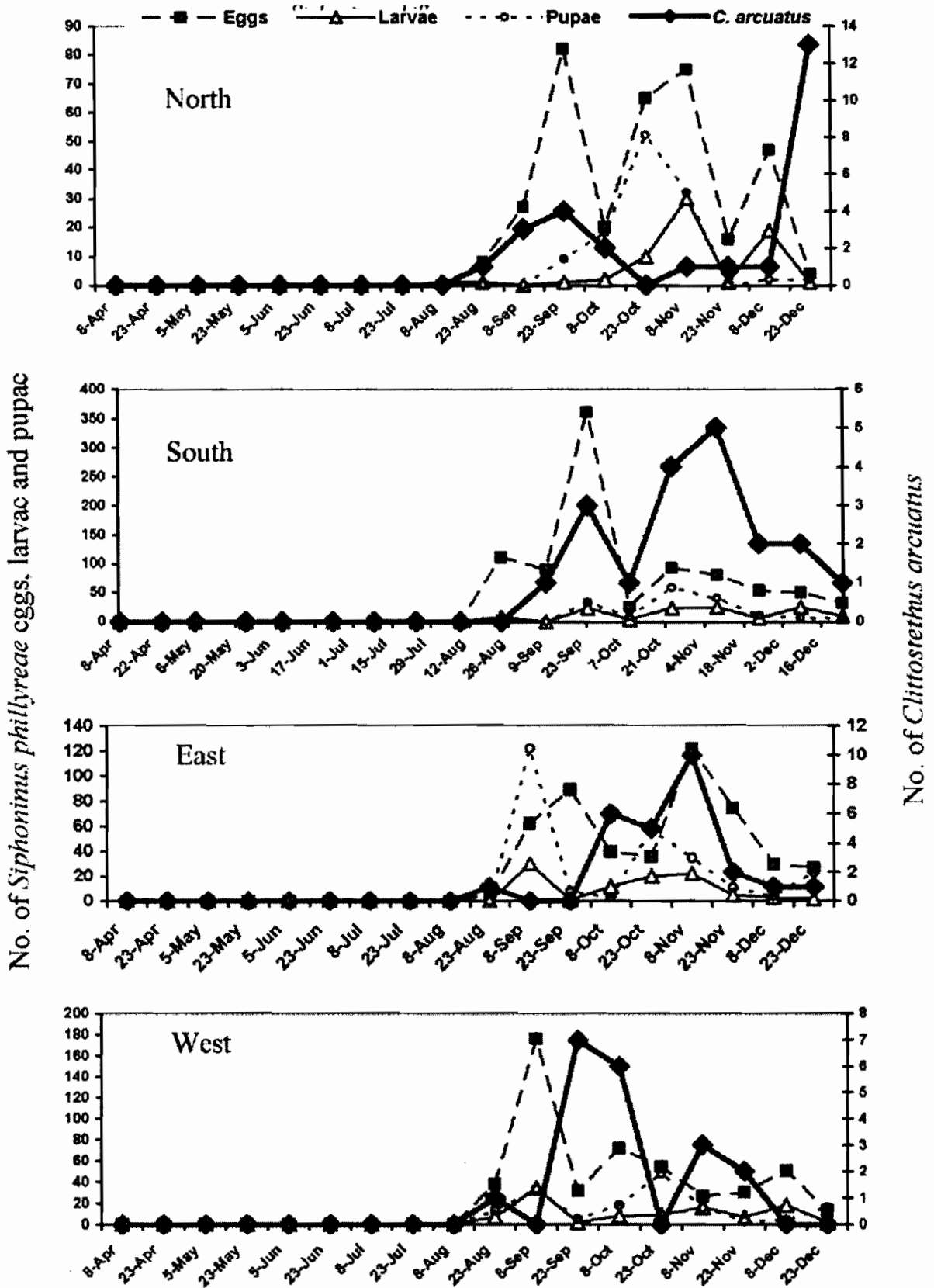


Fig. (1): Population dynamics of pomegranate whitefly, *Siphonimus phillyreae* immatures and related predator, *Clitostethus arcuatus* adults on the cardinal directions of pomegranate trees during 2005 season.

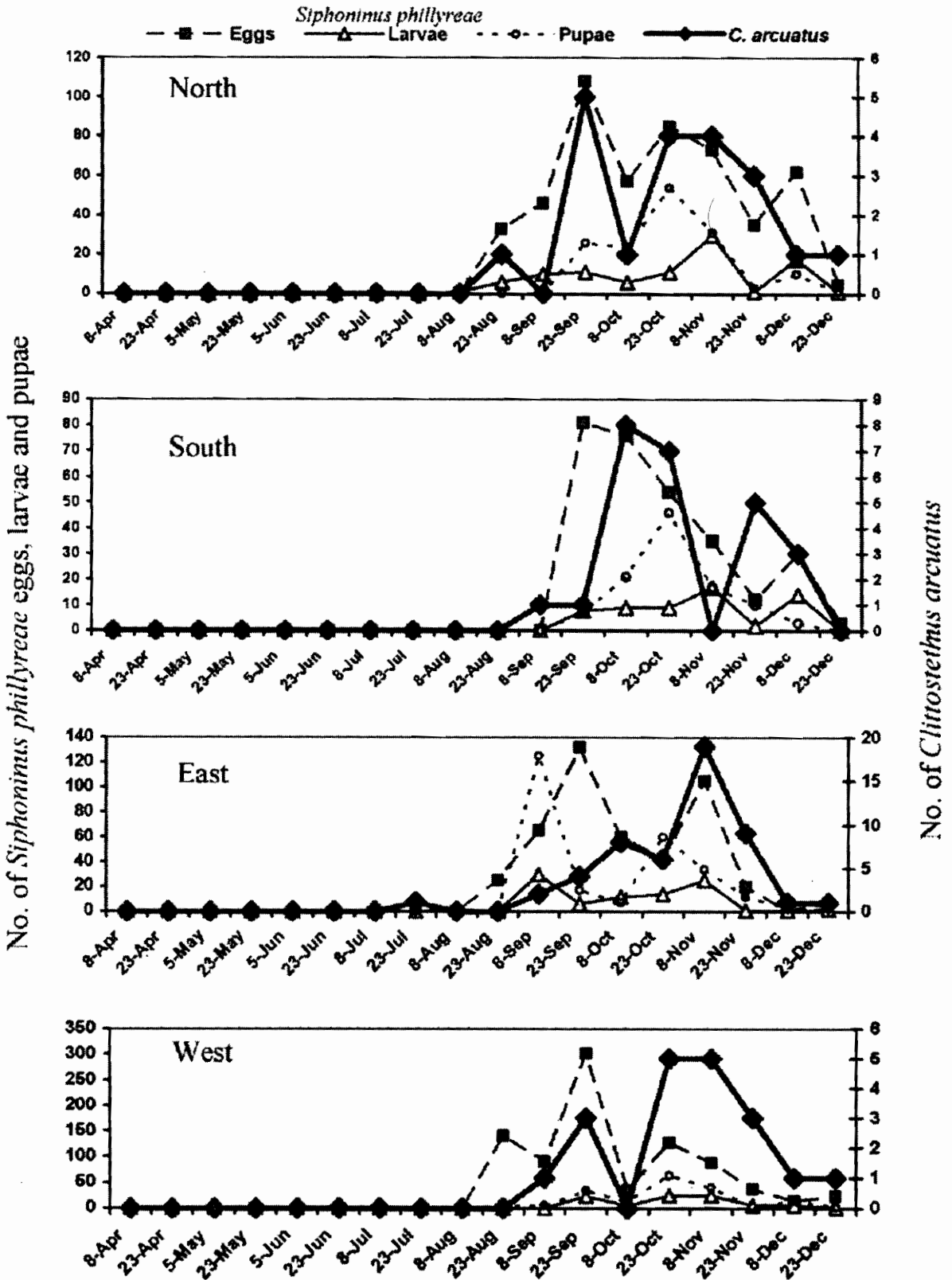


Fig. (2): Population dynamics of pomegranate whitefly, *Siphoninus phillyreae* immatures and related predator, *Clitostethus arcuatus* adults on the cardinal directions of pomegranate trees during 2006 season.

highest peaks of *S. phillyrea* eggs in the south, east and west directions were recorded on September 19. Also the peaks of the predator *C. arcuatus* were recorded the following inspection date (October 3) in the south and east directions, while in the west direction, the peak of the pest eggs and the predator coincided together on September 19 and the second peaks of the pest and the predator were recorded on October 18. Elwan (1982) found that maximum abundance of all stages of pomegranate whitefly took place between mid-August and mid-November. He also found that the different stages were distributed almost evenly on the different sides of pomegranate trees. Mesbah (2003) recorded that *S. phillyreae* immatuers started to occur with considerable numbers during August, especially in south direction in 1999 and in the west in 2001. He added that highest rates of *S. phillyreae* infestation were recorded during September through October in the three seasons. The present data indicated also that *C. arcuatus* correlated with *S. phillyreae*. This information were confirmed by many investigators, Bellows *et al.* (1992) recorded that the parasitoid *Encarsia inaron* and the coccinellid predator, *C. arcuatus* were introduced for biological control of *S. phillyreae* whitefly in California. *S. phillyreae* densities declined by two to four order magnitude on both ash and toyon plants in California after the introduction and establishment of *E. inaron* and *C. arcuatus* (Dreistadt and Flint, 1995). Abd Rabou (2006) released the predator, *C. arcuatus* to control *S. phillyreae* in different locations in Egypt on apple, olive, pear and pomegranate. He found that the population of the whitefly species decreased after releasing *C. arcuatus* in all locations. He also found that the population of *C. arcuatus* was increased after releasing.

ACKNOWLEDGEMENT

The author appreciated the effort made by Prof. Dr. Ramzy Sherif, Rice Research and Training Center, Sakha, Kafrelsheikh for revising the manuscript.

REFERENCES

- Priesner, H. and M. Hosney. 1932. Contributions to knowledge of whiteflies of Egypt. Bull. Min. Agric. Egypt, 121, 8 pp.
- Priesner, H. and M. Hosney. 1940. Notes on parasites and predators of Coccidae and Aleyrodidae in Egypt. Bulletin de La Societe Entomologique d'Egypte 24: 58-70.
- Abd-Rabou, S. 1998. The efficacy of indigenous parasitoids in the biological control of *Siphonius phillyreae* (Homoptera: Aleyrodidae) on pomegranate in Egypt. Pan-Pacific Entomologist, 74: 169-173.
- Abd-Rabou, S. 2006. Biological control of the pomegranate whitefly, *Siphonius phillyreae* (Homoptera: Aleyrodidae) by using the bioagent *Clitostethus arcuatus* (Coleoptera: Coccinellidae). J. Entomol. 3(4): 331-335.
- Bathon, H. and J. Pietrik, 1986. Zur nahrungsaufnahme des bogen Marienkaefers *Clitostethus arcuatus* (Rossi) (Coloptera: Coccinellidae) einem Vertilger des Kohlmottenlaus, *Aleurodes proletella* line (Homoptera: Aleyrodidae). J. Appl. Entomol., 102: 321-326.
- Bellows, T. S.; T. D. Paine and D. Gerling. 1992. Development, survival, longevity and fecundity of *Clitostethus arcuatus* (Coleoptera: Coccinellidae) in the laboratory Environ. Entomol. 21(3): 659-663.
- Dreistadt, S.H. and M. L. Flint. 1995. Ash whitefly (Homoptera: Aleyrodidae) overwintering and biological control by *Encarsia inaron* (Hymenoptera: Aphelinidae) in Northern California. Environ. Entomol. 24(2): 459-461.
- Elwan, E. A. 1982. Biological and ecological studies on the pomegranate whitefly, *Siphonius granati* P&H (Homoptera: Aleyrodidae). M.Sc. Thesis, Fac. Agric. Cairo Univ. 97 pp.
- Gerling, D. 1990. Whiteflies: their bionomics, pest status and management. Intercep Ltd., Andover, UK, 348 pp.
- Kahlon, N. 2002. Effect of type of cuttings and IBR on roots in cutting and plant growth in pomegranate (*Punica granatum*) cv. Kandhan. Hort. J. Vol., 15(3): 9-16.
- LaRuue, J. H. 1980. Growing pomegranate in California. DANR Pub. Lealet 2459.
- Loi, G. 1978. Osservazioni eco-etologiche sul coleottero Coccinellidae scimmino *Clitastethus arcuatus* (Rossi) predatore die *Dialeruodes citri* (Ashm.) in Toscana. Frust. Entom. 1: 123-145.
- Mesbah, A. H. 2000. Development and efficiency of *Clitostethus arcuatus* (Coleoptera: Coccinellidae) predated on *Siphonius phillyreae* (Homoptera: Aleyrodidae). Egypt. J. Biol. Pest Control., 10(2): 123-127.
- Mesbah, A. H. 2003. Pomegranate whitefly, *Siphonius phillyreae* (Halidy) (Homoptear: aleyrodidae) population dynamics and parasitism rates on pomegranate trees at Kafr El-sheikh governorate, Egypt. Egypt. J. Biol. Pest. Control, 13(1 & 2): 71-74.
- Mesbah, A. H.; A. H. El-Heneidy; S. M. Metwally; Z. Shenishen and H. A. Boraiei. 1998. *Clitostethus arcuatus* (Rossi) (Coleoptera:

Coccinellidae) a new recorded predator species, of citrus whitefly, *Dialeurodes citri* (Ashm.)

(Homoptera: Aleurodidae) in Egypt. Egypt. J. Biol. Pest Control, 8(2): 99-100.